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PART II

FEDERAL COMMUNICATIONS COMMISSION

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FIFTH NOTICE OF INQUIRY IN PREPARATION FOR A GENERAL WORLD ADMINISTRATIVE CONFERENCE IN 1979

FEDERAL COMMUNICATIONS COMMISSION

[Docket No. 20271; FCC 77-349]

INTERNATIONAL RADIO REGULATIONS

Fifth Notice of Inquiry [1]

In the matter of an inquiry relative to preparation for a General World Administrative Radio Conference of the International Telecommunication Union to consider revision of the international Radio Regulations.

Adopted: May 20, 1977.

Released: May 23, 1977.

By the Commission: Commissioners Wiley, Chairman; and White concurring in part and dissenting in part and issuing a joint statement; Commissioner Fogarty concurring in part and dissenting in part and issuing a statement.

1. On November 24, 1976, the Commission adopted a Third Notice of Inquiry in the above entitled matter (FCC 76-1099, No. 43086). It was released on December 6, 1976 and appeared in the FEDERAL REGISTER on December 13, 1976 (41 FR 54309). The period for comments and reply comments has passed.

2. The primary purpose of the Third Notice was "to present a proposed International Frequency Allocations Table (Article 5) and to solicit comments thereto." The proposed Table represented the status, at that time, of the development of the United States proposal for revisions to Article 5 of the international Radio Regulations; it took into consideration the comments received in response to past notices, the reports of various advisory radio Service Working Groups (SWG), and spectrum requirements made known by Government agencies. The proposed Table was accompanied by a narrative which contained a rationale for its contents and which noted a number of issues that had to be resolved before the U.S. proposal could become final; the narrative solicited specific comments on these issues in order to obtain guidance from the public on resolution of them. In addition, the Third Notice solicited specific comments on a draft protocol concerning the communications of protected medical transports which was proposed for inclusion in the Geneva Convention and on methods proposed for specifying the allowable frequency tolerance of radio transmitters. The Notice further solicited comments on "any other matter relevant to preparation for the 1979 WARC."

3. The names of parties which filed comments and reply comments in response to the Third Notice are given in Appendix 1. Although the comments and reply comments have been considered and will continue to receive attention as this preparatory effort proceeds, they are not summarized herein. Instead, their substance will be treated in the discussion which follows. It is not our intent to dwell on areas where the public agreed with proposals presented in the Third Notice of Inquiry; the discussions highlight those areas where the respondents felt their requirements were not being satisfied.

4. In reviewing the multitude of comments received in response to the Third Notice, it became apparent that many parties have misinterpreted the purpose and extent of this proceeding. This docket has been initiated for the purpose of preparing the U.S. proposals for the 1979 World Administrative Radio Conference, and it is the only issue that is involved. We recognize that in some cases it may be difficult to separate purely domestic issues from international matters; however, every attempt must be made to keep these issues distinct. As has been previously indicated in this docket, it is not a domestic Rule Making proceeding, but rather an Inquiry to determine the best U.S. proposals to modify the International Table of Frequency Allocations and associated Radio Regulations in order to meet future telecommunication needs. Since the international allocations table forms the framework of our domestic allocations table, the international table must have the flexibility built into it to accommodate national/regional needs as they arise. The table cannot remain static to accommodate only present on-the-air systems; it must be capable of accommodating future technological developments. Without this flexibility in the table, the ability of the U.S. to meet future requirements would be severely constrained. It is in this context that comments are solicited.

5. The agenda established by the Administrative Council of June 1976 of the International Telecommunication Union (ITU) for the 1979 GWARC was presented in paragraph 6 of the Third Notice, and that Agenda is still the guide for preparing U.S. proposals.

6. The Third Notice presented a draft protocol concerning communications for protected medical transports which was proposed for inclusion in the Convention on International Humanitarian Law applicable in armed conflict. Since no respondents commented on that draft protocol, we shall assume that the public favors it and we will proceed to take the appropriate action.

7. The Third Notice also solicited comments on methods for expressing frequency tolerances. That subject was further treated in the Fourth Notice of Inquiry in this docket along with discussions on small antenna earth stations, spacecraft stationkeeping, spacecraft antenna pointing error, Radio Regulation Appendices 3 and 4, and possible new emission designators.

8. This Fifth Notice of Inquiry in Docket 20271 includes discussions of articles in the Radio Regulations which deal with allocations, definitions, and technical and operational matters, and discussions of the Resolutions and Recommendations. We emphasize that we are presenting proposals for changes to these items. Depending on their further development, these proposals may or may not be submitted to the International Telecommunication Union; they may or may not be accepted at the 1979 WARC. National implementation will require further action by us. The proposals and associated discussions represent the views of the United States preparatory structure as identified to date. As previously indicated, other requirements will continue to be treated as identified.

9. The primary purpose of this Notice is to present a revised proposal for the International Frequency Allocations Table (Article 5) and to solicit comments thereto. In the development of this proposal, we have considered the comments and reply comments received in response to the Third Notice, the intentions of the Federal Government and information available to the Commission. The proposed Table is attached as Appendix 2 to this Notice; a discussion of its contents is provided in the following paragraphs.

INTERNATIONAL RADIO REGULATIONS (ARTICLE 5)

SPECTRUM BETWEEN 10 KHZ AND 400 KHZ

10. Allocation table changes proposed in this frequency range in the Third Notice were the subject of numerous comments and reply comments from interested parties. Due consideartion of the comments and continued evaluation of service requirements has led to several changes in the proposed Table of Allocations. In the following paragraphs we will discuss the proposed changes, as well as address the several areas of controversy developed in the public comments.

Amateur

11. The proposed changes in the Amateur allocation given in the Third Notice were generally well received by the amateur community. However, in the responses received from other services, notably the radiolocation service and the power line carrier system operators, there was repeated concern that the possibility of frequency coordination with the Amateur service is extremely remote due to the variable and unpredictable frequency usage of any given amateur radio operator. Therefore, it is felt that all services would benefit from the assignment of an exclusive allocation for the Amateur service wherever possible. This is what is generally proposed. This would have the additional effect of removing any unusual restrictions on amateur use in their exclusive channels, enabling more efficient use of a smaller allocation.

12. The need for an amateur allocation to be proposed by the U.S. to the 1979 WARC at 160-190 kHz has not been established. We have, however, proposed that Broadcasting be added in the 115-190 kHz range; this is treated in further detail in the Broadcast section.

13. Because of extensive national requirements, we have not been able to continue the proposal for Amateur shared use of the 1750-1800 kHz band. We have, however, maintained the proposal for exclusive Amateur use of the 1800-1900 kHz band. This proposal, if adopted by the 1979 WARC, should adequately provide for the Amateur service in this band. Because of the continuing

[1] 42 FR 11258.

need for LORAN in the 1900–2000 kHz band, we are proposing to maintain RADIONAVIGATION in this band, shared internationally with Amateur and other services.

14. At the 3500 kHz region, we are continuing the proposal for exclusive Amateur use of the 3500–3900 kHz band, but only on a Region 2 basis. Further, we are continuing the proposal for shared use of the 3900—4000 kHz band by the Amateur and other radio services.

Broadcast

15. Many comments were received regarding the proposed extension of the present AM broadcast allocation. In response to these comments, we are proposing international allocations that will provide for broadcasting between 115–190 kHz, and 1615–1800 kHz, noting that the international proposal for broadcast allocations between 525–535 kHz, and 1605–1615 kHz contained in the Third Notice have not been modified. We feel that the need for additional spectrum for the AM broadcasting service has been established. The present AM band, 535–1605 kHz, is used very efficiently in this country; however, the increasing complexity of applications and increasing cost of brodcasting antenna facilities necessary to protect existing stations greatly inhibits future development of this service. If the proposal is adopted internationally and implemented nationally, these channels could increase the diversity of programming choices available to listeners, and provide local broacast services to communities presently denied service due to existing interference situations.

16. If the broadcast allocation between 115–190 kHz is adopted internationally, national requirements dictate that existing operations (including power line operations) would have to be accommodated. This would mean the "engineering-in" of broadcast frequencies. Since AM broadcast operations are already subject to extensive engineering studies, we foresee no great difficulty in this regard. Thus, existing national requirements would be taken into consideration when domestic implementation of the broadcast allocations were undertaken.

17. As mentioned earlier, we are proposing internationally an allocation for broadcasting at 1615–1800 kHz, to be shared with, among others, the Radiolocation service. We feel that the need for the proposed broadcasting allocation has been amply justified. Sharing difficulties, particularly with the Radiolocation service, will be treated under that service.

Mobile

18. Comments in response to the Third Notice on Land Mobile below 400 kHz were very limited in number. The Third Notice contained a proposal to add this service to the 1615–1750 kHz band, deleting the Mobile Service. At this time, and in light of other proposals, we are proposing Mobile at 1605–1800 kHz, which could provide for land mobile use of this band after appropriate national rulemaking.

Radiolocation

19. Several comments were received regarding the present high interference levels being experienced in the shared band 1605–1800 kHz. As indicated earlier, we are proposing an allocation for Broadcast in Region 2 in this band. We solicit detailed parameters of present and foreseen systems for developing meaningful sharing criteria. In this regard, we are adding a proposed footnote 195B to provide for Radiolocation on a world-wide basis in the bands 1615–1800 kHz and 3230–3400 kHz. We fully recognize that if this proposal is adopted internationally, Radiolocation will have to continue to be satisfied on a national basis. Proposed footnote 195C, for the 1615–1800 kHz band, would assist in ensuring that Radiolocation would not receive harmful interference in the proximity of international boundaries. Notwithstanding this, we feel that Broadcasting and Radiolocation can share the band, and that Radiolocation requirements will be met. Further, we may be able to guarantee Radiolocation access to this band by setting aside nationally, and within the interior of the country, a certain number of frequencies in which no broadcasting signals in the periphery of the Radiolocation emission would be permitted to exceed a specified level. A frequency width of 6 kHz with no broadcasting signals exceeding 0.1 microvolt in the Radiolocation emission has been suggested, to satisfy one existing known national requirement. In addition, Radiolocation is being continued to be proposed in the 1900–2000 kHz band.

Radionavigation

20. As suggested in comments filed in response to the Third Notice, it is proposed to add Aeronautical Radionavigation in the 190–200 kHz band in Region 2. The fixed requirements remaining in this band would have to be accommodated. We are also proposing that the permitted status for Aeronautical Radionavigation in the 525–535 kHz band be restored. Further, we are proposing that this service be reinstated as previously allocated in all regions for the band 510–525 kHz.

21. The U.S. Maritime interests which commented on our proposal for an Aeronautical Radionavigation permitted allocation at 415–490 kHz, felt strongly that the present allocation for maritime services and this proposed allocation were incompatible. We have deleted the proposed Aeronautical Radionavigation allocation; however, we note that there is a continuing need to provide for navigation beacons in applications such as on off-shore platforms and at smaller airports. We solicit specific comments as to how that need can be accommodated.

22. We are proposing to delete Aeronautical Radionavigation from 1605–1800 kHz since no justification for retention has been received and further, to delete Radionavigation from 1800–1900 kHz. This latter proposal is predicated on the removal of LORAN operations in this band by 1980. Since the status of LORAN in the 1900–2000 kHz band is unclear, we have made no proposal to remove the allocation from this band, noting that the secondary allocation proposed for Radiolocation is continued. We are, however, proposing a modification to footnote 198 and a new footnote 198A, which should provide for other use of this band once the LORAN system is disestablished.

SPECTRUM BETWEEN 4 MHZ AND 27.5 MHZ

Amateur

23. Comments were filed by the WARC Advisory Committee for Amateur Radio and the American Radio Relay League (ARRL); twenty-five amateur radio clubs; and thirty amateurs. While the comments varied, nearly all concerned one or more of the following: proposed allocation of additional bands at 10, 18, and 24 MHz; rearrangement of the proposed allocations at 21 MHz, which would cause expensive equipment modification; and correction of the interference at 7 MHz between the Amateur and international Broadcasting services.

24. In this Notice of Inquiry we are proposing an additional band at 25760–25860 kHz for the Amateur Service which could be considered as satisfying the request for a band at 24 MHz, but we are unable to propose bands at 10 and 18 MHz. The request for rearrangement of the 21 MHz allocation has been fulfilled since comments submitted by the Radio Technical Commission for Marine Services indicate that such a rearrangement would be acceptable. Removal of the interference at 7 MHz between Amateur and international Broadcasting has been difficult to accomplish because of the large demand for spectrum and the I.T.U. Region 1 and 3 allocation of 7100–7300 kHz to the Broadcasting service. The attached proposal provides the bands 6950–7000 and 7000–7250 kHz for the Amateur service on an exclusive worldwide basis and the bands 7250–7300 and 7300–7500 kHz for the Broadcasting service on a shared basis. We believe this proposal could be acceptable to international Broadcasters and would eliminate the sharing difficulties presently encountered by the amateur and the international Broadcasters.

Aeronautical Mobil (R)

25. Comments were filed by Aircraft Owners and Pilots Association (AOPA); Special Committee 129 of the Radio Technical Commission for Aeronautics; Aviation Service Working Group (ASWG; and jointly by Aeronautical Radio, Inc. (ARINC) and the Air Transport Association of America (ATA).

26. ARINC, ATA, AOPA and A-SWG supported the proposals for the bands between 4 and 27.5 MHz as set forth in the Third Notice and those proposals are unchanged in this Notice.

Fixed Service

27. As mentioned in the Third Notice, and affirmed by the comments of the American Telephone and Telegraph Co., a substantial part of common carrier and other operations using frequencies in the

Fixed Service at 4–27.5 MHz have been shifted to satellite and to cable systems. The table attached to this Notice proposes substantial reallocations of spectrum currently allocated to the Fixed Service to other services. To alert the parties affected, we are listing below the proposed services and the portion of the spectrum proposed for reallocation to those services:

Present ITU band (kilohertz)	Existing service	Proposed ITU band (kilohertz)	Proposed new service
4438–4650	Fixed mobile except aeronautical mobile (R)	4438–4560	Maritime mobile.
5060–5250	Fixed	5200–5250	Do.
5250–5430	Fixed land mobile	5250–5300	Do.
6765–7000	Fixed	6950–7000	Amateur/amateur satellite.
7300–8195	do	8000–8195	Maritime mobile.
11975–12330	do	12130–12330	Do.
13360–14000	do	13360–13410	Radio astronomy.
13360–14000	do	13950–14000	Amateur.
14350–14990	do	14350–14400	Do.
15450–16460	do	16310–16460	Maritime mobile.
17360–17700	do	17360–17410	Do.
20010–2100	do	20010–20230	Do.
20010–21000	do	20950–21000	Amateur/amateur satellite.
22720–23200	do	22720–22855	Maritime mobile.

28. In addition to these proposed reallocations, this Notice contains proposals to add other services to bands now allocated exclusively to the Fixed service. As the fixed operations move from this part of the spectrum, those services can make more use of the vacated frequencies.

29. It is our intention to accommodate the fixed users that justify their operation in this part of the spectrum by reassigning the operations to suitable frequencies. To further reduce the impact on the Fixed users, we are considering proposing a footnote to the allocations table along the following lines:

On the condition that harmful interference is not caused to the Maritime Mobile Service, the frequencies 4438–4560 kHz, 5200–5300 kHz, 8000–8195 kHz, 12130–12330 kHz, 16310–16460 kHz, 17360–17410 kHz, 20010–20230 kHz, and 22720–22855 kHz may be used exceptionally by fixed stations communicating only within the boundary of the country in which they are located.

30. This note would be similar to the present Nos. 209 and 211. We are not now, however, proposing a power limit against the Fixed service using frequencies from within the maritime allocations. Comments on the proposed footnote, along with a power limit, if any, are requested.

Maritime Mobile

31. Comments on this portion of the spectrum were filed by Special Committee 69 of the Radio Technical Commission for Marine Services (Maritime Mobile Service Working Group, MM–SWG); American Telephone and Telegraph Company (AT&T); North Pacific Marine Radio Council (NPMRC); Mobile Marine Radio, Inc. (Mobile); Hoyt Haddock; and Arthur Thompson. Reply comments were filed by RTCM SC69 (MM–SWG) to the comments filed by Arthur Thompson.

32. RTCM (MM–SWG), AT&T, NPMRC, Mobile and H. Haddock strongly supported the proposed expansion of allocations to the Maritime Mobile service in the bands between 4 and 27.5 MHz. RTCM (MM–SWG) and AT&T urged that these allocations be further expanded. AT&T stated that the proposed Maritime Mobile allocations were only ⅓ of that necessary to accommodate the service and noted that frequencies in this portion of the spectrum are required because satellite systems will be attractive only to vessels with large and special needs. The RTCM stated that the increased allocations proposed in the Third Notice would fall far short of accommodating needs and submitted additional statistics which would justify additional increases. It believes that the HF Fixed service should be further reduced. Arthur Thompson believes that HF should be put to use for services which have no other alternatives and noted that the Maritime Mobile service is lagging in the implementation of new techniques such as satellite communication. The RTCM replied that there is a growing number of small ships for which the costs of satellite communications could not be justified. In general, while there was generous support in favor, there was no substantial comment in opposition to expansion of allocations to Maritime Mobile service in the 4–27.5 MHz bands.

33. In the attached Table we are proposing the band changes between 20010 and 21850 kHz, as urged by the Amateur service and supported by the RTCM, which involves the proposed allocations for the Amateur, Amateur-Satellite, Mobile, Fixed, Maritime Mobile and Broadcasting Services. We cannot, at this time, propose the additional increases in spectrum which have been requested by the Maritime Mobile interests.

Mobile

34. Comments were filed on behalf of the Citizens Band service by the International CB Radio Operators Association (CBA). In their comments, CBA restated an earlier request by the Citizens Radio Advisory Service WARC Advisory Committee that one megacycle of spectrum be proposed for reallocation to the Citizens Band service between 26 and 28 MHz. However, the Consumer Electronics Group of the Electronic Industries Association was opposed to any expansion of the service at 27 MHz because it believes that the expansion would result in more TV interference. The Private Land Mobile SWG commended the Commission for retaining the allocations below 470 MHz which are used by the Land Mobile services. The proposals contained in this Notice are unchanged from those contained in the Third Notice.

Radio Astronomy

35. The National Academy of Sciences supported the general plan of the proposed table, but concurred with the comments of the Radio Astronomy Service Working Group (RA–SWG). The RA–SWG commented that the proposed allocation at 13360–13410 kHz should be expanded from 50 to 100 kHz, and further, that the proposed allocation at 25850–26050 kHz would better meet the needs of the Radio Astronomy community if it were located at 25900–26100 kHz. Considering the needs of all services, we are unable to propose an expansion of the proposed allocation at 13 MHz from 50 to 100 kHz, and find it necessary to relocate the previously proposed allocation to Radio Astronomy from 25850–26050 to 25600–25760 kHz. The opposition to the allocation previously proposed at 25 MHz for Radio Astronomy, expressed by the Auxiliary Broadcast Service Working Group, is treated under the section headed Broadcast Auxiliary.

Broadcast Auxiliary

36. The National Broadcasting Company recommended that the frequency table continue to provide for the use of remote pickup broadcast base and mobile stations. These are currently provided in the band 25850–26100 kHz. The Auxiliary Broadcast Service Working Group opposed the proposed allocation to Radio Astronomy at 25850–26050 kHz on the basis that the allocation would substantially negate use of 25850–26100 kHz for remote pickup broadcasting. The F.C.C. rules currently locate remote pickup broadcasting within the international allocation (25600–26100 kHz) for Broadcasting. In this Notice we are proposings changes in allocations for Broadcasting and Radio Astronomy; these changes would not impede continuation of the past domestic practice of meeting the needs of remote pickup broadcast within the Broadcasting allocation, except perhaps for that portion of 25600–26100 kHz which we are proposing for reallocation to Radio Astronomy and Amateur use.

HF Broadcasting

37. Comments were filed by Trans World Radio, Trans World Radio Pacific, Far East Broadcasting Company, Inc., Family Stations, Inc., and the International Broadcasting Service Working ing Group. The comments urged the allocation of additional spectrum for International Broadcasting. Family Stations noted that there has already been a de-facto allocation of spectrum due to out-of-band operations conducted by some countries. The respondents generally believed that the Commission's treatment of their needs was inadequate and, perhaps, arbitrary. They noted that program hours is not a good measure of broadcast growth and pointed to channel hours as the relevant statistic

which should be used (the channel hours figure increases as the number of transmitters broadcasting a particular program grows). They also noted that the Panel of Experts established following the 1959 Ordinary Administrative Radio Conference had not recommended single sideband for broadcast emission, but had limited that recommendation to radiotelephony and telegraphy systems only.

38. The thrust of the comments was that interference between stations in the bands allocated to HF Broadcasting Service is so severe that additional spectrum must be allocated since the present HF broadcasting bands are overcrowded. The number of transmitters worldwide has since 1959 increased approximately four times. Extensive monitoring by many countries has established the extreme nature of the congestion beyond reasonable doubt. The basic questions are—why are the bands so crowded and can anything be done about the growing congestion?

39. The crowded condition of the bands is partially due to the fact that the HF broadcasting services have been confined to spectrum space allocated in 1947 at the Atlantic City Conference. Over 100 countries are using the bands either for international or domestic coverage, and many for both services. This growth in usage has led to the application of higher power installations and the use of more than one transmitter to cover the same service area.

40. The proposals contained in this Notice of Inquiry are aimed toward the long term alleviation of the congestion and a reduced need for higher and higher power. First, three new bands are proposed as follows: 4063–4123 KHz; 7250–7500 KHz; and 13,700–13,800 KHz. The 7 and 13 MHz bands should provide for greater frequency diversity permitting stations to operate under more optimum propagation conditions depending upon length of path to the area to be served thereby reducing the need for competing signals in the same band.

41. Secondly, this Notice proposes the expansion of three bands to alleviate crowding. These expansions are as follows: The 11,700–11,975 KHz band would be expanded downward to 11,600 KHz; the 15,100–15,450 KHz band would be expanded upwards to 15,550 KHz, and the 17,700–17,900 KHz band would be expanded downward to 17,600 KHz.

42. We feel that the above proposals will do much to treat the basic causes of congestion in the HF broadcasting service. However, there is a great need for technical and operational rules which could facilitate the shared use of spectrum and accommodate the future growth of HF Broadcasting.

43. The time between now and the 1979 Conference is probably insufficient to develop technical and operational rules. Certainly there will be insufficient time at the Conference to fully develop plans for High Frequency broadcasting and a subsequent specialized WARC will probably need to be held to deal only with that service. In this connection, because of the present uncertainty with respect to the specific wording of certain items on the 1979 Conference agenda, there is some question as to whether Article 10 of the international Radio Regulations is to be included. Alternatively, it is possible that a resolution to hold a specialized High Frequency broadcasting conference may result. We are, therefore, requesting comments on either eventuality although the 32nd Administrative Council Session meeting in Geneva during the period May 23–June 10, 1977 may clarify the point.

44. As to the details to be taken up in such a specialized WARC we solicit comments. In this Notice we propose maximum power limits for HF Broadcasting. Should minimum power limits also be established? Compatible single side band transmissions have been suggested and offers have been made to undertake tests. A move in this direction could provide space for growth in the present bands and could result in a significant reduction in primary power requirements. Co-channel and adjacent channel protection ratios and minimum required field strength over a service area should be examined.

45. Further, Appendix 3 draws attention to proposals which among other matters would limit power, and stresses the need for consideration of compatible single side band which could improve spectrum efficiency considerably. While the conversion to CSSB would create difficulties at first in implementation, nevertheless we believe these proposals deserve intensive consideration.

46. Although requirements for HF Broadcasting have not yet been finalized, some allocations and technical changes are being proposed.

47–51. [Reserved.]

SPECTRUM BETWEEN 27.5 MHZ AND 1215 MHZ

52. Our Third Notice stated that this portion of the spectrum may be the most contentious portion to be considered in preparation for the 1979 WARC and at the WARC itself. We believe this is so because this range of frequencies is the most desirable for local broadcasting as well as non-broadcast communications. Frequencies between 450 MHz and 1 GHz are particularly suited for short-range mobile communications and will likely be the only area of the spectrum where short-range mobile communications growth can be expected to be accommodated into the longterm future. Frequencies between 470 and 890 MHz are also the range of spectrum where television broadcasters expect growth to occur. Comments and service working group reports received in response to our Notice confirm these observations. We summarize the nature and extent of the problem between 470 MHz and 890 MHz:

53. The international Radio Regulations provide exclusive frequency allocations between 470 and 890 MHz for the Broadcasting Service in Region 2.[1] Region 2 includes North and South America. In the United States the band 470 to 890 MHz provides for UHF TV channels 14 thru 83 (70 UHF-TV channels, each 6 MHz wide). Commission decisions taken in Docket 18261 and 18262 respectively provide for Land Mobile access to the lower 7 channels (14–20) in 13 major urbanized areas and for reallocation of the upper 14 channels (70–83) to the Land Mobile services nationwide with existing TV translators on a secondary basis.

Statement of the Problem

54 Beyond Commission decisions taken in Dockets 18261 and 18262 there have been non-television requirements stated particularly for short-range mobile communications, which, by the year 2000, could amount to approximately 268 MHz in the band between 470 and 806 MHz.[2] On the other hand, Broadcasting requirements for commercial and noncommercial UHF television stations have been stated which, by the year 2000 could require a full complement of frequencies between 470 and 806 MHz.

55. In reviewing the comments and the service working group reports we have found that projecting service requirements to the year 2000 is not an easy task for spectrum users. Justifying such projections is particularly difficult since the communications industry is growing and technology is changing so fast that requirements for frequencies so far into the future are subject to considerable uncertainty.

BAND 470–890 MHZ

56. In this Fifth Notice of Inquiry, we are proposing that Region 2 of the International Table be modified along the following lines:

470–512 MHz BROADCASTING/MOBILE
512–608 MHz BROADCASTING
608–614 MHz RADIO ASTRONOMY
614–806 MHz BROADCASTING
806–890 MHz Broadcasting/MOBILE

57. This proposal, if adopted by the 1979 WARC, would bring the international allocation table into line with our current domestic table except in the band 806–890 MHz where it provides for international allocation for Mobile service primary and broadcasting secondary and a footnote for mobile-satellite service operation. In addition, national rules confine mobile operations in the bands 470–512 MHz and 806–890 MHz to the land mobile services; and for Broadcast operations, to TV translators on a secondary basis in the 806–890 MHz band.

58. The above allocation proposal would reduce the exclusive Broadcasting allocations in Region 2 and would not provide for all the exclusive Region 2 spectrum requested by the TV Service Working Group. Neither would it provide for spectrum between 584 and 614 MHz requested by the Aeronautical Services worldwide, or spectrum between 582

[1] Except that Footnote 332 provides for radio astronomy use of the band 608–614 MHz.

[2] Private Land Mobile 102 to 174 MHz; Aeronautical Mobile (R) 30 MHz; Maritime Mobile 18 MHz; Radioastronomy 6 MHz; FM Broadcast 24 MHz; B'Cast Sat. (Aural) 6 MHz; Personal Radio services 10 MHz.

and 606 MHz requested by the Maritime Services worldwide. It is argued that co-equal allocations would provide the flexibility requested by the land mobile community for a primary Broadcasting and Mobile allocation in Region 2 in the band between 512 and 806 MHz to meet potential need for between 102 and 174 MHz of spectrum in this band.

59. The Commission is not convinced that sufficient evidence has been introduced to justify a position other than that outlined in paragraph 56 for any of the services indicated. Proposals for the use of the band 470–890 MHz range all the way from exclusive television broadcasting to a total co-equal allocation of broadcasting and mobile across the band. The Commission finds that the various service working group reports and comments received do not adequately justify in terms of documented future growth, scientifically based studies and usage data, the requests for exclusive worldwide spectrum allocations for aeronautical and maritime services or the shared Region 2 international allocation requested by the land mobile community. Absent such documentation we see no compelling reasons, at this point, to provide for exclusive allocations or additional flexibility in the international table between 470 and 890 MHz beyond that described. Accordingly, we continue to solicit comments and supporting data to fully support retention of present allocations, as well as any changes in the allocations as proposed in paragraph 56. We also solicit further views regarding alternatives which may exist to satisfy requests for spectrum between 470 and 890 MHz.

60. It should be noted that the Commission created a Task Force on October 14, 1976, to obtain information and conduct studies to aid in developing policies concerning frequency allocations in the UHF television band (470–890 MHz). It is hoped that the interim results of its studies will be available early enough to assist the Commission in formulating a final U.S. position on UHF allocations for the 1979 World Administrative Radio Conference. One of the areas to be examined by the Task Force concerns the requests of the non-television services seeking the use of the 470–890 MHz spectrum. Time constraints of the WARC have limited the major focus of the group in this area to consideration of the international services requests. These are the Aeronautical and Maritime Services which seek, respectively, 30 and 18 MHz of the spectrum domestically allocated to the UHF television band. While much information has been developed on the present VHF operations of the Maritime Service and a lesser amount on the Aeronautical Service, additional specific data is needed for each service.

61. As technology progresses it is likely that improved methods of television transmissions will emerge providing a new generation of higher quality pictures and sound. It is questionable if such a new generation can be expected to emerge within the spectrum currently allocated to VHF, but may emerge in the UHF band. It is also anticipated that lower power local origination television stations may also develop in the UHF frequencies. Further, the future needs of minorities and non-commercial operators may be heavily dependent on frequency availability in the UHF band. Additional comments, documenting as far as possible, future broadcast type needs in the UHF band are invited.

62. The Commission recognizes the complexity of issues found at this band both internationally and domestically, issues which relate to technology, growth of services, the need for flexibility, and the efficient use of spectrum. Comments are requested on these and other related issues.

63. [Reserved]

Aeronautical Mobile

64. The aeronautical community has withdrawn its proposal for a navigation requirement while stating the continuing need for operational control communications between 584 and 614 MHz. A flexible allocation is desirable for aviation services. Communications in the Aeronautical Service occur between aircraft of all nations and U.S. land stations as aircraft arrive and depart U.S. airports; aircraft are subject (functionally and technically) to compulsory equipment outfitting for safety resulting from international treaties, and international frequency planning is accepted practice. Moreover, the lead time required to plan an aeronautical conference, which is convened to consider planning for aviation only and does not consider any other service, necessitates that band limits for aeronautical operations be specified in advance. The aeronautical community believes that these factors warrant specific allocation proposals.

65. Comments were solicited in the Third Notice as to satisfying additional aeronautical requirements of 8 MHz for operational control. In the Third Notice, no proposal was made to satisfy this requirement between 136 and 150 MHz. In this Fifth Notice we are again unable to advance a proposed solution. While attempting to address the requirement, we have looked at the idea of satisfying a portion of the requirement in the mid-range future by adding a footnote to the band 136–138 MHz which would provide for gradual reduction of presently allocated services. This footnote could read along the following lines:

ADD 273C In the band 136–138 MHz no new transmitters are authorized the Space Research, Space Operation or Meterlogical-Satellite services after 1–1–82. Operation by these services are on a primary basis until 1–1–87 and on a permitted Secondary non-interference basis to the primary service until 1–1–90. Operation by the above services is not permitted after 1–1–90. In this band the Aeronautical Mobile (R) Service is not authorized operation in this band until 1–1–82. During the period 1–1–82 until 1–1–87, operation by the Aeronautical Mobile (R) service will be on a secondary non-interference basis. After 1–1–87 the Aero Mob (R) Service is the primary service.

66. In looking at the present space users between 136–138 MHz, we find that there is a major capital investment of perhaps over 5 Billion dollars in the U.S., and a further substantial investment on a worldwide basis. In addition to present satellite systems in this band, *i.e.*, GOES, ITOS, Timation Navigation, SOLRAD, and others, planned future activities indicate a continuing need for U.S. and foreign satellite operations. It thus becomes apparent that the satisfaction of aeronautical requirements in this band is not possible. Comments on other solutions to this problem are requested.

67. Notwithstanding the above, we note that our rules provide for 25 kHz channel spacing the band between 128.-825 MHz and 132 MHz effectively doubling available frequencies to 128 for enroute (operational control) functions. While we recognize the limitations on the use of these frequencies due to international coordination, information is requested on an implementation schedule for their use and the effect which use of these 25 kHz channels will have upon (1) satisfying current and future needs of aviation for operational control, (2) the need for additional VHF spectrum, e.g., 136 MHz–138 MHz and (3) the need for UHF spectrum, *e.g.*, 584 MHz–614 MHz. Comments are solicited on this approach and these questions, and further, how this requirement can be satisfied.

67A. In support of the effort discussed in paragraph 60, information is requested in the following areas of present spectrum usage for both network and off-network stations in busy locations in congested areas:

1. Peak-hour occupancy
2. Average-hour occupancy
3. Waiting time
4. Number of messages per day
5. Length and type of messages transmitted.

Amateur/Amateur-Satellite

68. The Amateur community generally supported proposals in our Notice with the exception of the introduction of the Mobile service in the band 220–225 MHz. Amateurs also request provision for Amateur-Satellite service in Region 2 for the band 902–928 MHz which in accordance with existing national policy is used on a primary basis for Radiolocation systems. We have made proposals for a secondary allocation for Amateur in this band. Due to national requirements, we have been unable to accommodate a proposal for Amateur-Satellite at 220–225 MHz. We have addressed the 220–225 MHz Mobile allocation elsewhere.

69. In addition, the National Astronomy and Ionosphere Center (NAIC) recommended that we propose a shift in the Amateur-Satellite allocation at 435–438 MHz to the top of the band (447–450 MHz). We believe that experience at 435–438 MHz has demonstrated that amateur satellites have little or no potential for interfering with other radio services which share the same allocation and that

reliable control of the emissions of an amateur satellite can be accomplished, further providing necessary protection to other services. Moreover, present sharing arrangements with Radiolocation has proved to be satisfactory. To shift Amateur-Satellite allocations to 447–450 MHz is likely to cause interference between Amateur stations since the band 442–450 MHz is available for amateur repeater stations. Thus, we propose to maintain the Amateur-Satellite allocation.

Broadcasting

70. The television industry stated that there has been no showing that it is necessary to revise the international table of allocations to accommodate either land mobile demand for UHF channels or any other nonbroadcast demand. Moreover, Broadcasters stated that the full complement of frequencies allocated to Broadcasting will be needed for local service, and that no feasible alternatives exist. Further, Broadcasters project that public television stations will grow from 160 presently to more than 420 by the year 2000 and expect similar growth and saturation for commercial UHF stations.

71. Thus, the television broadcasters recommended maintaining the exclusive international allocation to Broadcasting between 470 and 890 MHz. Our Third Notice in this proceeding proposed reallocation of the band 806 to 890 MHz to the Mobile service in Region 2 to be consistent with Commission decisions taken in Docket No. 18262. However, broadcasters proposed that access to that band for UHF television translator stations be retained, which is presently provided for in our rules.

72. FM Broadcasters requested that a new FM service be proposed as originally suggested between 782 and 806 MHz. Such a service, as with other such proposals, is properly addressed in domestic rule making, provided, however, that the allocation for Broadcasting in Region 2 remains in the international table of allocations.

Land Mobile (Common Carrier)

73. The common carrier land mobile community supported our Third Notice with respect to existing allocations but noted that no provision was made for decisions taken in Docket No. 18261. In addition, our proposal for a Mobile allocation between 896–902 MHz and 941–947 MHz, which may be used for a worldwide air-ground public correspondence service, was supported by the common carier land mobile community and AT&T because it has the necessary flexibility for possible future domestic inquiry and allocation. While the Aviation Service Working Group also supported the Mobile allocation, the Private Land Mobile Service Working Group opposed consideration of an air-ground service since reserve frequencies potentially available to private land mobile might be used. The Auxiliary Broadcast Service Working Group also objects to inclusion of an air-ground service since Broadcasters seek to restore use of the band 942–947 MHz for Aural STL and Inter-City Relay services. We also note that sharing problems may exist with the Radiolocation service.

74. In this Fifth Notice we are proposing a secondary allocation for Radiolocation in the 896–902 and 941–942 MHz bands. Radars, mostly mobile, now operating in these bands and others, and projected during the future will have the following general parameters:

Power Peaks—1–3 Megawatts.
Pulse Repetition Rate—250–300 pps.
Duty Cycle—about 1%.
Beam Width (Horizontal)—1–3 degrees.

The distribution of platforms carrying these radars is relatively sparse on a worldwide basis.

75. We are continuing our proposal for a Mobile allocation at this time to be consistent with our goal of flexibility and to provide for future planning in accordance with long term needs and priorities. However, comments are invited from interested parties, particularly the general aviation community, with respect to the need for and scope of the worldwide public air-ground service, which might operate in the 896–902 and 941–947 MHz bands.

76. The Common Carrier Land Mobile and Aviation Service Working Groups have submitted substantial justification for this public air/ground service. This service is primarily intended to provide a radiotelephone link between the airplane and the ground telephone system to give passengers and crew a means of communicating for purposes *in addition* to those associated with the safety, control or origin of flight of the aircraft. This type of service is presently not permitted on frequencies allocated to the Aeronautical Mobile (R) Service. An existing system which operates in 450–460 MHz is inadequate for anticipated future expansion and is primarily limited by agreement with the scheduled airlines to General and Business Aviation uses. Any air-ground public telephone system which would cater to airlines as well as general and business aviation should have adequate frequencies to support world-wide needs. An ultimate public correspondence system should be able to communicate with an aircraft in flight anywhere and be able to connect it directly with the worldwide telephone network at or near its geographic position.

In summary such a system may consist of the following:

1. Provide public radiotelephone service to commercial aircraft and general aviation.
2. Provide a 0.98 probability of obtaining a channel.
3. Have geographic distribution of ground stations of between 77 and 154 miles.
4. Accommodate aircraft flying between 2,000 and 60,000 feet.
5. Provide up to 300 radio channels spaced between 25 and 40 kHz.

77. Further, we note that if an air-ground system is implemented at 896–902 and 941–947 MHz, it may in fact be too close to the Aeronautical Radionavigation band at 960–1215 MHz, causing unacceptable interference aboard the airframe. Comments on this issue are requested.

78. Finally, to what extent may the band 584–614 requested by the Aviation SWG for operational control communications satisfy the needs for a public air-ground system? As to the international nature of the proposed air-ground service, how could it be operated in conjunction with, while being distinguished from, the Aeronautical Mobile (R) service which provides for operational control and safety communications? Comments on these issues are requested.

Land Mobile (Private)

79. The private land mobile community indicated that dramatic recent growth has been experienced in stations authorized, particularly in major urbanized areas, projected similar growth into the future, and identified new uses for communications beyond existing applications. It contends that growth would have to be met by recently made 900 MHz allocations, the 902–928 MHz band, the 952–960 MHz band, and some amount of spectrum (between 102 and 174 MHz) out of the remaining UHF-TV bands between 512 and 806 MHz. Therefore, the private land mobile community recommended a co-equal Mobile and Broadcasting allocation between 470 and 806 MHz to provide flexibility in the international table of allocations and to permit flexibility to leave domestic UHF-TV allocations intact to the degree that is necessary. Thus, domestic decisions would be made in accordance with our own needs and priorities.

80. With respect to the band 902–928 MHz, Hazletine Corporation opposed introduction of Amateur and Mobile services on the basis that such action could discourage development of the band for the primary Radiolocation service.[3] A proposal of flexibility in the international table is the more important goal and future domestic rule making will address the specific services in accordance with long-term needs and priorities, if the proposal is adopted at the 1979 WARC. We further note that there are also national Radiolocation requirements, on a continuing basis, in this band on a primary basis.

81. The Private Land Mobile SWG supported our proposal to identify spectrum below 1 GHz to accommodate mobile satellite uses but opposed such use in the band 806–890 MHz which is the home for future terrestrial land mobile systems. AT&T opposed the proposal on the basis that no new unique service is proposed which could not be performed by Land, Aeronautical, or Maritime Mobile-Satellite services, for which there are already frequency allocations, and that fundamental sharing problems when one or both sharing services are mobile have not been addressed. General Electric and the Domestic Public Land Mobile SWG opposed the proposed footnote 329B and

[3] In this connection, national rules provide for Automatic Vehicle Monitoring (AVM) operations subject to not causing harmful interference to government stations and accepting interference from ISM devices and government stations authorized in the band.

stated that space radiocommunications in this band would limit spectrum use efficiency by the inability to re-use channels on a geographic basis to the same extent as terrestrial systems; thus, the objectives of Docket No. 18262 would not be realized. COMSAT General supported the footnote or specific allocations. We are proposing to keep the footnote at this time, to be consistent with our goal of flexibility and to provide for future planning. However, comments are invited from interested parties as to the nature of services which could be provided (*e.g.*, is it confined to land mobile users or are small fixed stations or other mobile users to be served); why such services could not be accommodated in specific service allocations elsewhere, and if the footnote should be proposed in another frequency band, what band? Further, what practical coordination problems may exist with terrestrial users and how may these be minimized? Comments on these issues are requested.

Maritime Mobile

82. In the Third Notice we indicated that little hope existed to statisfy existing requirements on Appendix 18 frequencies and that inadequate spectrum is available for growth between 150 and 174 MHz. Comments received in response to our Third Notice confirm that long-term maritime requirements are such that they could not be satisfied on VHF frequencies even if all Appendix 18 frequencies were made available. However, the maritime community still requested deletion of those portions of footnote 287 which permit administrations to make assignments to other services, in order to provide full use of Appendix 18 frequencies to meet immediate maritime needs not presently satisfied and to conform with internationally agreed use. While comments provided by the American Association of Railroads strongly opposed deletion of footnote 287 on the basis that such action would have consequences endangering the operations and safety of the entire railroad industry, the Associated Public Safety Communications Officers, Inc. stated that if the Commission determines to recommend deletion of footnote 287 and if it is accepted by the WARC, then displacement of public safety licensees should be accomplished over a period of at least seven years from the effective date of the international decision. Only 4 frequencies representing less than 5 percent of police VHF frequencies are affected, as compared to 33 frequencies representing one-third of railroad VHF frequencies, and 13 frequencies representing one-third of highway maintenance VHF frequencies. In brief, since it appears that long-term growth for maritime services, particularly public correspondence communications, cannot be met by Appendix 18 frequencies, we question how immediate needs of maritime can be met except through domestic rule making which is outside the scope of this proceeding. It appears that future growth particularly for maritime public correspondence will need to be satisfied at higher frequencies, i.e., above 400 MHz.

83. Although the maritime community agrees that the goal of flexibility in the international table is a desirable objective particularly for domestic services where control of allocations between domestic mobile services and broadcasting may be expected to be settled after WARC 79 through domestic rule making, it contends that its allocations are not necessarily controlled within the U.S. and that it is basic and essential that specific worldwide allocations be provided to permit future planning. Furthermore, specificity would preclude a situation where the U.S. is at variance with the rest of the world, a situation which presently exists on the Appendix 18 frequencies.

83A. Also in support of the effort discussed in paragraph 60 information is requested in the following areas: (1) Public coast stations operated by non-AT&T licensees are requested to furnish data concerning the following areas of their station's operation: (a) Channel occupancy during the busiest hour of an average day.

(b) Average message length (conversation time).

(c) Average set-up time (i.e., from the time the operator responds to a call, how long does it take to place the call).

(d) Number of messages handled each month for the years 1975 and 1976.

(2) In certain areas the UHF Task Force has noted that existing public correspondence channels are heavily used. In some areas it appears that assignment of additional channels could be accomplished, but have not been requested. What criteria are presently used to decide when and where to request assignment of additional channels.

(3) 1.5 MHz has been requested at UHF for on-board communications. These operations involve communications over short ranges for which higher frequencies could be substituted; however, we recognize there may be difficult technical problems associated with the development of hand-carried equipment above 1000 MHz. UHF is more useful for longer range communication with mobile units. Comments on the use of frequencies other than UHF to perform this function are needed.

(4) 3 MHz is requested for aeronautical-maritime coordinated communications. Specific data justifying this request is sought as it represents twice the VHF maritime spectrum currently allocated in the U.S.

(5) Use of maritime frequencies on board recreational craft is a national rather than an international concern. Many recreational boaters presently use Citizens Band (CB) equipment rather than VHF maritime equipment. Comments are requested recommending alternatives looking towards solution of the recreational boaters communication requirement with an allocation similar to CB but with consideration given to the distress function.

(6) Specific data should also be furnished to justify the spectrum requests for vessel traffic services (0.2 MHz), ship-to-shore radiotelephony (0.75 Mhz) and radiotelegraphy (0.6 MHz).

Mobile (Personal Radio)

84. In the Third Notice a Mobile allocation was proposed in the bands 220–225 MHz and 890–947 MHz, to provide future flexibility for the introduction of mobile operations.

85. Comments by Amateurs and the television industry opposed the Mobile allocation at 220–225 MHz, anticipating personal radio use in the band, and thus, intolerable interference to existing operations. Amateurs and the TV industry suggested that 900 MHz should be the future home for personal radio users.

86. We believe that it is premature at this point to discuss spectrum to be allocated to domestic mobile services since such discussions prejudge the outcome of the WARC–79 Conference and domestic allocation proceedings likely to occur after WARC–79. Flexibility to plan for future needs is the more important goal; thus, we are proposing to maintain the mobile allocations in Region 2.

Radioastronomy, ISM, Fixed

87. We are unable to propose an allocation for Radioastronomy use at 150–153 MHz, or to propose a shift in the Amateur Satellite allocation at 435–438 MHz to the 447–450 MHz band. Heavy land mobile use of the 150–153 MHz will continue to prevent any protection to radioastronomy at 150–153 MHz. The Amateur Satellite allocation is discussed elsewhere.

88. With respect to the ISM allocation at 915 MHz, the ISM Community supports the proposal to expand existing ISM bands worldwide by introducing footnote 340 into Regions 1 and 3.

89. The Private microwave community opposed our proposal to introduce the Mobile service into the band 952–960 MHz on the basis that microwave stations are expected to grow from 2600 at present to 6700 by the year 2000. We are proposing to maintain the co-equal Fixed and Mobile allocation to be consistent with our flexibility approach. If such a proposal is accepted by the 1979 WARC, domestic rulemaking would be required to determine which frequencies would be available and for what service or services.

Spectrum Between 1215 MHz and 10.7 GHz

The Use of ISM Frequencies and Wireless Transmission of Power

90. Considerable information has been received concerning the expansion of industrial electronics. Several comments have suggested that the ISM bands be harmonically related and that the existing 5800 MHz allocation be changed. Study of this matter, however, suggests that this could be unreasonably disruptive of existing arrangements and our present thinking is, therefore, to retain existing bands.

91. With regard to the wireless transmission of power, this is seen as an entirely different problem, not in any way

related to ISM matters. One form of the wireless transmission of power is the concept of a Satellite Solar Power System (SSPS), and a footnote has been proposed looking toward the accommodation of such a system. Several parties have adversely commented on the proposed footnoted frequency allocation to the Solar Satellite Power System (SSPS) use. In view of its technical complexity, possible impact on other services, and significance of technological concepts, the following information is provided.

92. The operational SSPS has been proposed to contain a space station in the geostationary orbit where the solar energy will be converted to dc using either the photovoltaic effect of the silicon solar cell or a heat engine generating electricity. For an SSPS delivering about 5000 MW of dc power, two solar panels, each one having a dimention of 5.2 km by 4.33 km [4] would be required. The maximum theoretical efficiency of silicon solar cells is about 20 percent while the efficiency practically obtained is about 11 percent. The currently expected lifetime, which is influenced by the environment, is about 10 years. Solar radiation damage causes a logarithmic decay of solar cell effectiveness. Research on radiation-resistant solar cells is in progress which is predicted [4] to result in a life-expectancy of 30 years.

93. The dc generated at the space station is fed to a microwave generator whose design is based on the principle of either a cross-field amplifier (CFA) device or a klystron. The output of each individual tube could range from 2 to 5 kW. It has been projected that about 1 million or more tubes would be needed for each SSPS, and the total radiation contemplated is on the order of 5–10 gigawatts.

94. For a 1 km diameter transmitting phased array antenna having a gaussian distribution in the beam, the diameter of the receiving antenna would be about 7 km for interception of 90 percent of the transmitted energy. Depending on the design, the received microwave density levels could vary from about 100 mW/cm^2 at the center to about 0.1 mW/cm^2 at a distance of 13 km from the center of the received beam.[4] The direction of the transmitted beam is proposed to be accurately controlled by a pilot signal transmitted from the center of the receiving area. The optimum frequency of operation is stated [4] to be between 2 and 4 GHz, and fundamental frequencies of 2450 and 5800 MHz have been proposed for this service.

95. The receiving antenna would intercept, collect and rectify the microwave energy into dc which could be transmitted as dc or as ac after suitable conversion. Distributed half-wave dipole antennas and Schottky barrier diodes are proposed to respectively receive and rectify the microwave energy. The receiving antenna element spacing is proposed to be 0.6 times the operating wavelength requiring a total of 14 billion elements.

96. As ninety percent of the SSPS energy will be confined to a beam of about 0.01 degree in diameter, an antenna pointing accuracy of about a tenth of the beam width or 0.001 degree could, then, be required. We consider it premature to speculate on the feasibility of practically achieving this order of antenna pointing accuracy.

97. The peak noise power of CFA is predicted to be 85 dB/MHz below the fundamental. The noise power can be reduced by introducing a filter between each generator and the antenna with a predicated [4] 6 dB attenuation per octave (of 50 MHz) per section.

98. The U.S. International Radio Consultative Committee Study Group draft paper 2/302 states that a 5 cavity Klystron envisaged for use with the SSPS would provide 120 db attenuation at a distance of 50 MHz from the center frequency, thereby providing a 26 db margin from a single SSPS above the ITU power flux density (PFD) limit of $-154dBW/m^2/4kHz$, although this is still above the limit required for Radio Astronomy Service.

99. The energy from the different CFA tubes is additive at the operating frequency and is focused in the main beam of the phased array. However, we consider it premature to speculate on the performance of the phased array outside the operating band and at the harmonic frequencies. In addition to the modification of the footnote 357A proposed by AT&T, it could be specified that the radiation from the SSPS shall meet all the ITU PFD regulations outside the occupied bandwidth of the SSPS, and that the energy from the SSPS shall be attenuated by specified amounts outside the occupied bandwidth, and that the occupied bandwidth shall be 5 MHz.

100. The projected cost of SSPS power (5 gigawatt unit) at the bus bar, for an operational life of about 30 years, is estimated [4] to be 2.7 cents per kWh. For an operational life of 10 years, the cost of SSPS power could increase to 8.1 cents per kWh. The projected costs of power from terrestrial solar plants (100–150 MWe) i.e. non-tracking flat plate, 2–D, brayton, steam, chemical, central receiver and photovoltaic are estimated [4] to be 9.7, 8.6, 7.3, 5.5, 5.7, 4.6 and 8.6 cents per kWh respectively.

101. The optimistic launch data for an operational SSPS is 1995 although there are many technical uncertainties in the program.

102. There are several areas of concern as they relate to the possibility of interference or biological damage. For the present footnote 357A has been modified accordingly.

103. These problem areas are itemized below. (1) The possibility of interference associated with out-of-band radiation. This consists of 3 principal components: (a) Harmonics of the fundamental frequency; (b) Noise spectrum associated with each component of (a); (c) Spurious signals.

(2) Scattering and other phenomena in the ionosphere and upper atmosphere which could possibly result in crossmodulation with other carriers, or widespread interference fields.

(3) Phase fluctuations on the received signals and its harmonics due to corresponding fluctuations in the refractive index. Such fluctuations could produce an intrinsic noise spectrum due to the associated phase modulation of the received signal.

(4) Area coverage problems associated with the severe pointing accuracy and side lobe requirements of the main beam. The U.S. International Radio Consultative Committee Study Group draft paper 2/302 indicates a sidelobe level of −25 dB (referred to the peak radiation) which represents a fundamental radiation density of about 0.3 mW/cm^2 at a distance of 7km from the center of the receiving antenna. We are not certain as to the practically achievable sidelobe level from a 1 km diameter phased array.

(5) Physical effects in the upper atmosphere which may be associated with such high flux densities and are ordinarily of no consequence but which may result in hitherto unsuspected sources of interference.

(6) Biological and ecological hazards due to the radiation levels contemplated both on the earth's surface and throughout the world's atmosphere, particularly relating to aircraft in flight.

104. We are soliciting detailed and explicit comments on each of the problem areas outlined above, so that appropriate allocations and guard bands can be structured.

Radio Astronomy

105. Two bands connected with radio astronomy remain as serious problem areas. The first of these is the band 1370–1400 MHz. The RA service views this band as one of its highest priorities since observations of the hydrogen line are related to critical studies of the universe. At present, RA use of this band is covered only by footnote 349A, and its importance is felt by RA to justify exclusive use of the band. At present this band is allocated in Region 2 to the Radiolocation Service, and is utilized to satisfy national requirements. At present, the request of the RA service is being intensively studied, however, a resolution has not been forthcoming at the time of writing.

106. The second problem area is in the 2670–2690 MHz band. The proposed exclusion of the Broadcasting Satellite Service from this band as suggested in the 3rd NOI was met with very strong opposition. The Broadcasting Satellite Service has severe demands for growth and urgently needs this spectrum. The RA group on the other hand indicates that a CCIR limit for interference in this band has already been developed and should serve as a guide for sharing. However, this limit would certainly preclude

[4] Solar Satellite Power System Concepts, Hearing before the Subcommittee on Space Science and Applications and the Subcommittee on Energy Research, Development and Demonstration of the Committee on Science and Technology. U.S. House of Representatives, Ninety Fourth Congress Second Session, February 20, 1976, (No. 67).

satellite service operating in real time since the limit is established by virtue of the integration time permissible with RA observations.

107. The RA service has pointed out that a 1 percent bandwidth is required for observation in the 3 GHz region, the 2670–2690 slot being the most promising choice. We have looked at other options in this region. However, the interference level to be expected from existing services would be too great, or the restrictions on these services necessary to obtain the required protection would be too great. We are therefore unable to resolve this dilemna without further suggestions from the parties concerned. These should resolve the following: (1) Is it possible for the Broadcasting Satellite Service to meet the required RA interference criteria or relinquish spectrum in areas where astronomers are making continuum observations. Alternatively, are there any possibilities whereby effective sharing criteria (time technology area, etc.), regardless of determinants, can be developed; (2) The band 3325–3355 MHz, where discrete observations are currently being made appears to be the next most obvious choice. The allocation of this portion of the spectrum to Radioastronomy was suggested by the PSSC in lieu of the present allocation at 2690–2700 MHz.

Continuum measurements require determination of interference and sharing criteria. What measures can be proposed by the services occupying this band so that effective use by the RA service can be obtained. We seek the ideas of all parties concerned, to solve this sharing problem. (3) Are there other alternatives which might be addressed which would permit the RA service to obtain a 1 percent continuum band for its observations, and share this effectively with other services.

108. Until this problem is resolved, we are proposing to maintain both the Broadcasting Satellite and Radio Astronomy Services in the band 2670–2690 MHz.

Fixed-Satellite Service

109. Since the 3rd NOI, considerable effort has gone into attempting to provide additional spectrum space for this service. Problems still remain formidable, and efforts continue to obtain bandwidths in spectrum also required for other national needs. Whatever decisions are finally made, it is evident that highly coordinated sharing criteria will pertain. The options still remain as outlined in the 3rd NOI.

110. We recognize that highly coordinated sharing criteria will need to be developed if the Fixed-Satellite Service is to successfully share the 3400–3700 MHz, 4400–4700 MHz, and 5725–5925 MHz bands with other services which are required to satisfy other national needs. In response to the Third Notice of Inquiry, several parties requested further details with respect to the proposed addition of Aeronautical Radionavigation in the band 3500–3700 MHz. This band is intended for use, inter alia, by ground based airport surveillance radars and this addition would provide international recognition and protection of a service which has already been allocated domestically. There are probably similar questions regarding sharing in the other bands referenced above. Recognizing that any sort of meaningful evaluation of this problem would be impossible without a better understanding of the proposed uses for these bands, we have been provided with an independent analysis of the problems of sharing these bands between the Fixed-Satellite Service and the other services having requirements therein. This analysis is attached to this Notice of Inquiry as Appendix 5 and highlights the complexity and difficulties of sharing in these bands. (Appendix 5 supplied by the Executive Branch.)

111. The principal difficulty with the 6425–6925 MHz band occurs at the two ends; above 6875 MHz the band is used by the Auxiliary Broadcast (mobile) service; while from 6425–6575 MHz, it is used in a similar fashion by other mobile services. Sharing in these portions of the band, if actually possible, can only be accomplished under carefully defined conditions, and at this juncture there is not agreement on what these conditions should be. We therefore seek advice as to the definition of specific criteria for such sharing. The alternative would be, of course, to relinquish the top 50 MHz and the bottom 150 MHz of this spectrum.

112. The proposed companion band (down link) of 4400–4900 is a currently heavily used band, and again, sharing if feasible at all, would require special criteria. The more basic question then is this—if it is not possible to use the 4400–4900 band, what should be paired with the proposed 6425–6925 band? Alternatively, would it be preferable to dispense with this proposal, and aim rather toward expansion near the existing 4 and 6 GHz bands? The use of these bands has demonstrated the feasibility of sharing in already heavily congested portions of the spectrum. The fact that this has proven successful would seem to suggest that a combination of ingenuity and inventiveness might be used to develop criteria for those other portions of the spectrum under discussion here. In making such comments it is recognized that the nature of the services which have successfully shared these bands (existing at 4 and 6 GHz) lends them to such sharing. Much greater problems exist in other bands proposed due to different kinds of services already in occupancy, and in the case of mobile, there can be no doubt that sharing problems may be almost insurmountable. Nevertheless, we would urge both the present users of the various bands suggested, and also the Fixed-Satellite service, to view the total situation in terms of solutions rather than problems. The logical extensions of the 4 and 6 GHz bands would be in the 3.4–3.7 GHz, and 5.625–5.925 GHz bands as originally suggested in the Third NOI. At this juncture, the maximum bandwidths (in each of these bands) that appear feasible to share with existing services is quite limited. As yet it is not clear whether any part of the 4.4–4.9 GHz spectrum could readily be shared. The questions are two fold: (1) are such small bandwidths of value, considering that difficult sharing criteria would certainly be necessary; and (2) can special criteria be established which could, as a practical matter, permit sharing more of the spectrum? The problems therefore resolve to the following:

(1) What are the real needs of the service in terms of continuous and contiguous bands?

(2) Is it possible, given conditions of use, geographical location, power, probability of service, power modulation, and/or any other criteria, that sharing criteria can be developed where they do not presently exist? We submit this is the critical question before all users. The many comments and reports in connection with this matter reflect the desperate need of all services. It is evident that partnerships previously considered impossible are going to have to evolve in order to bring any degree of satisfaction to all those who need and demand spectrum.

(3) What are the band options, in terms of preference, that the Fixed-Satellite service should address most vigorously, so that criteria can be developed in terms of priority?

113. In view of the foregoing comments, we have tentatively suggested the following: (1) The band 6425–6925 MHz be used for the up link, (as in the 3rd NOI) recognizing the need to develop explicit sharing criteria with the mobile services.

(2) The down link be split into two bands (a) 3400–3700 MHz and (b) 5725–5925 MHz recognizing the need to develop appropriate sharing criteria with existing services in these bands.

114. We solicit comments with respect to these choices, taking into account the foregoing statements. The problems inherent in these choices are formidable and are at present unresolved and we therefore seek information which will aid us in providing the Fixed-Satellite service with needed spectrum. It should be further pointed out that the Broadcasting-Satellite service has requested use of the 3400–3700 MHz band also, and this of course further exacerbates the sharing problem. This request for access to the 3400–3700 MHz band by the Broadcasting-Satellite Service was not known to the authors of the sharing analysis performed in Appendix 5 prior to its completion, and therefore no analysis is available with respect to the Broadcasting-Satellite Service. It can be assumed, however, that due to the special characteristics of the Broadcasting-Satellite Service, the sharing problems foreseen will be even more severe than for the Fixed-Satellite Service. We solicit comments as to how the Broadcasting-Satellite Service also might be accommodated in some useful fashion.

Broadcasting-Satellite Service

115. The Broadcasting-Satellite Service Working Group has asked for the rentention of the 2500–2690 MHz band, as well as expansion into certain other bands. The 2670–2690 MHz portion of the above band was proposed, in the Third

Notice of Inquiry, for reallocation to the Radio Astronomy Service. However, in view of the strong opposition demonstrated by certain parties to this proceeding, as well as alternative proposals put forth, this question is still very much open for discussion. Until this problem is resolved, we are proposing to maintain both the Broadcasting-Satellite and Radio Astronomy Services in the band 2670–2690 MHz. Reference should be made to the section on Radio Astronomy for a more detailed discussion on this item.

116. The band 2300–2500 MHz has been suggested as an additional allocation to the Broadcasting-Satellite service. The proposed table does not reflect this service, but the problem must be addressed before the allocations can be finalized. Existing services have indicated serious opposition to this proposal. Attention should also be drawn to the fact that this band is also allocated for ISM use and we have proposed a footnote which would provide for the wireless transmission of power from space at 2450 MHz. However, the fact that the Broadcasting-Satellite Service is not shown in any part of this band in the current table is not intended to mean that consideration of its sharing in the band has been eliminated.

117. There has also been a request for Broadcasting-Satellite Service access to the 3400–3700 MHz band. Use of this band for satellite service has been discussed under the Fixed-Satellite Service, which is presently allocated internationally in this band. Conditions for the shared use by both the Broadcasting-Satellite and Fixed-Satellite Services, along wtih existing services, present serious problems and comments are solicited in this respect.

Aeronautical Mobile Satellite Service

118. In response to the Commission's request for comments on the general philosophy proposed by the Aviation SWG that space applications are merely extensions of the aeronautical terrestrial services, and thus should not be accorded separate status, COMSAT General states that the philosophy was rejected at the 1971 WARC and has not been advanced by other SWG's in preparing for the 1979 WARC. While we believe that the aviation philosophy may be useful in existing exclusive aeronautical terrestrial allocations, there are no compelling reasons to eliminate the specific allocations to Aeronautical Satellite Services in the bands 1542.5–1558.5 MHz and 1644–1660 MHz.

119. With respect to these allocations, the aviation community has requested maintaining them for aeronautical mobile-satellite (R) use. We note that no specific justification has been advanced ot maintain 30 MHz for the exclusive use of the Aeronautical Mobile Satellite Service. There is a lack of U.S. air carrier interest in the experiment, hence, comments are requested as to whether or not the aviation requirements for 15 MHz in each direction, which were presented by the U.S. at the 1971 Space WARC, are still valid.

120. On the other hand, there is allocated a total of 15 MHz for the exclusive use of the Maritime Mobile Satellite Service and we have received extensive requirements of need for approximately 25 MHz beyond existing allocations. The Maritime SWG states that the operation of MARISAT has opened up new applications stemming from marine seismic and drilling communications requirements; that the potential airplane market is considerably less than the ship market for an international satellite system; that a convention and operating agreement on the INMARSAT Organization have been opened for signature and will likely provide a single international system during the next several years to serve ships and structures operating in the marine environment; and that if additional allocations are not provided, it is likely that service to some users may not be able to be offered. All of these these factors imply more vigorous interest for the maritime satellite service and the need for a reallocation of the bands between 1535 and 1660 MHz to more accurately reflect the needs of the two services. In this connection, COMSAT General states that a portion of the 1558.5–1636.5 MHz band can be allocated to the Maritime Satellite Service since requirements of the new Aeronautical Radionavigation Satellite Service between 1595 and 1636.5 MHz can be satisfied in existing Aeronautical Mobile Satellite (R) Service frequency allocations intended to encompass domestic and international air traffic control as well as operational control. The Maritime SWG suggests expanding the 1 MHz shared Aeronautical/Maritime Mobile Satellite bands at 1542.5–1543.5 MHz and 1644–1645 MHz by 6 MHz each into the Aeronautical Mobile Satellite bands, thereby providing flexibility needed for development of either service or for a cooperative venture. Comments are requested as to which portions of the bands 1535 to 1660 MHz if any, should be reallocated for Maritime Satellite Service use or shared with Aeronautical Satellite Services. We address separately the frequency bands between earth stations at fixed points and satellites.

121. In considering the shared use of these allocations between the aviation and maritime communities, merit was seen in the possible shared use of these bands for coordinated distress and safety operations. Consequently, we propose the addition of a new footnote 352L which reads, "In the frequency bands 1542.5–1543.5 MHz and 1644–1645 MHz distress and safety operations of the Maritime-Mobile Satellite and the Aeronautical-Mobile Satellite Services shall be given priority".

Maritime Services

122. While spectrum within the existing 500 MHz of allocations in the Fixed Satellite Service (e.g., at 6/4 GHz and 15/11 GHz) will continue to be needed to meet estimated requirements for maritime communications between satellite and land, it appears that projected non-Maritime growth is expected to exceed these allocations. Whether or not this occurs, existing spectrum and any additional allocations provided for the Fixed Satellite Service must include uplink and downlink provisions for maritime users (i.e., about 16 MHz uplink and 24 MHz downlink).

123. As the use of the maritime satellite service grows, it will become increasingly desirable to provide shore and satellite frequencies which do not have to be coordinated with the fixed satellite services. One way to accomplish this would be through the use of a footnote to existing allocations. One precedent for this was set by aeronautical interests with the addition of footnote 383B to the 5000 MHz to 5250 MHz band. However, it is noted that the bands 2900–3100 MHz and 5460–5600 MHz are extensively used by high power fixed and mobile radars for Radionavigation and Radiolocation functions. Furthermore, specifics concerning the use of frequencies within these bands by radar systems is not readily available due to established practice of granting band assignments. Therefore, considering the electromagnetic environment, the usefulness of the proposed footnote 367C is questionable unless the establishment of international regulatory changes concerning modification of existing radar systems and assignment processes are proposed and accepted. It may be preferable to find a more suitable band for the Fixed Satellite Service than to proceed with this approach. A footnote 367C for the required Maritime bands has been added and comments are requested. As an alternative, should the footnote be proposed for the band 5000 to 5250 MHz to provide for the maritime frequencies? Such proposal might provide flexibility needed for development of either mobile-satellite service or for a cooperative venture.

124. We have proposed use of the band 1710–1720 MHz from space stations to ship earth stations. However, comments indicate that communications needs will be greater in the ship to shore direction. Thus, we propose an additional allocation of the band 1970–1990 MHz for Maritime Mobile Satellite Service use.

125. The remainder of Maritime Mobile Satellite Service projected spectrum needs has not yet been satisfied. However, our Notice addresses this question under Aeronautical Satellite Service.

126. Provisions are proposed to be made for radar beacons and ship board transponders in the bands 2900–2920 MHz and 9300–9320 MHz and for Shipboard radars in the bands 2920–3100 MHz and 9320–9500 MHz, which were not addressed in the Commission's Third Notice. With respect to the provisions for the bands 9300–9320 MHz and 9320–9500 MHz comments are solicited concerning an appropriate mechanism to be used to accommodate maritime radar beacons and interrogator-transponders. For example, should the band be split into two portions, i.e., 9300–9320 MHz and 9320–9500 MHz? The band 9300–9320 MHz would be labelled, under Radionavigation, with "(Radar Beacons) (Shipboard

Transponders)". The band 9320–9500 MHz would be labelled, under Radionavigation, with "(Shipboard radars)". One alternative would be to accommodate the above operations through the use of footnotes. A second alternative could be to place the 20 MHz allocation referenced above for "(Radar Beacons) (Shipboard Transponders)" at the upper end of the band, i.e., at 9480–9500 MHz, with the 9300–9480 MHz portion containing the "(Shipboard radars)" designation. A third alternative would be to accommodate the requirements for shipboard transponders by footnote in the band 9480–9500 MHz which is relatively unused and to provide for fixed frequency RACONS in the 9300–9320 MHz band. This last alternative would eliminate the possibility of co-channel interference between very low powered RACONS and relatively high powered shipboard transponders. Noting that RACONS are used to mark navigational hazards and, consequently, interference to these devices could result in the loss of life and property, and significant environmental damage. Separate allocation provisions for shipboard radars in the bands 2920–3100 MHz and 9320–9500 MHz may not be required as these bands already allocated to the Radionavigation Service on a primary basis.

Additionally, it is important to note that frequency support for land/coast based radars used for maritime radionavigation purposes in these bands is a continuing requirement and would be prohibited only if the use of shipboard radars is permitted. There also appears to be an inconsistency between the proposal for shipboard transponders in the 2900–2920 MHz band and the existing footnote 367A. Comments are requested concerning resolution of this problem. One final point to be considered is the fact that within the band 9300–9480 MHz, the frequencies 9345 MHz and 9375 MHz are extensively used for airborne weather radars.

127. Comments are requested concerning how to satisfy the recognized requirement for radar beacons and shipboard transponders in this frequency range.

128. We have received a request for the establishment of a new international footnote RR404c for the band 10.55–10.68 GHz, to read as follows: "Operations of the Maritime Mobile Service using this band for safety of shipmovement by telemetry, data exchange and telecommand systems shall be protected from harmful interference in areas of inland waterways, ports, and coastal zones." The proposed footnote RR404c, will clearly establish and provide regulatory protection against harmful interference for future maritime mobile telecommunications pertaining to safety of ship movement. In addition, it provides for maritime communication systems needed to enhance the protection of life, property and the environment, e.g., future collision avoidance systems, tug-tow telemetry/telecommand systems and ship-shore interface communications for handling dangerous cargos.

Amateur Service

129. In the 1215–1240 MHz band, the needs of the Radio Navigation Satellite Service, inview of its safety of life feature has been regarded as of paramount importance; consequently, amateur usage in this band has been proposed for deletion. With respect to the 10–10.5 GHz band, comments in response to the Third Notice of Inquiry expressed a desire to include Amateur Satellite Service in this band. We have carefully examined this request and have concluded that due to the extensive use and particular types of radars in this band, sharing with the Amateur-Satellite Service is impractical.

130. In the 2300–2400 MHz band, the Third Notice of Inquiry proposed allocating 10 MHz (2310–2320 MHz) for satellite service. This conflicts with mobile service requirements. Consequently, a band for Amateur Satellite use is proposed at the top end of this portion of the spectrum, 2390–2400 MHz. This should better serve amateur needs and should also be compatible with the other services making use of this part of the band.

Additional Requirements

131. Several bands have not been addressed specifically, but do require consideration. They are:

(1) 2025–2110 MHz: This band is currently used to meet mobile requirements, and is also used under footnotes 356AB and 356ABA for space applications. The proposal here is to upgrade these footnotes to a primary status in the Table. These footnotes allow operation by the Space Research and Earth Exploration Satellite Services, in the Earth-to-Space direction, Space-to-Space links are also contemplated in the Space Research Service. Space-to-Space transmissions are required by the international Radio Regulations to adhere to a power flux density limit for any transmission reaching the Earth's surface of between −144 and −154 dBW/m² per 4 kHz of bandwidth, depending upon the angle of arrival. No significant sharing problems are anticipated.

(2) 2110–2120 MHz: This band is also currently used to meet mobile requirements, and footnote 356ABA allows operation of the Space Research Service. It is proposed to give the Space Research Service (Earth-to-Space) (Deep Space only) a primary allocation in this band. No sharing problems with the terrestrial services are anticipated.

(3) Requirement of the Aviation services at 2300 MHz: The Aerospace Radio Flight Test Radio Coordinating Council (AFTRCC) and the Aviation Services Working Group have pointed out that the frequency spectrum from 2310–2450 MHz could not be used completely inasmuch as footnote 357A designates 2450 MHz ±50 MHz for the wireless transmission of power. (This has since been changed to 2450 MHz ±10 MHz) They propose instead that the spectrum from 2300–2390 MHz be designated for aeronautical telemetry with Radiolocation, Amateur, Amateur-Satellite, Fixed, and Mobile accommodated in the band 2390–2450 MHz. We have in large part satisfied this requirement. We have proposed the upgrading of the Mobile allocation in the 2310–2390 MHz band and proposed footnote 349C to provide that the primary use of the mobile service in this band is to aeronautical mobile for telemetering purposes. It should be noted that we have retained the Radiolocation Service as a primary service. Experience has demonstrated that with the intensive scheduling which can be accomplished in the field, these two services can share the band on a co-equal, primary basis.

SPECTRUM ABOVE 10.7 GHz

Aeronautical Mobile/Aeronautical Mobile-Satellite

132. ARING and ATA stated that "* * * the bands above 40 GHz allocated jointly to the Aeronautical and Maritime Services should be split into separate and distinct services * * *." They stated (1) that the Aeronautical Service is a safety service precluding sharing of common bands, (2) that there is a dissimilarity of disciplines between the Aeronautical and Maritime Services and (3) that the "provision of shared bands may well lead to the development of incompatible systems for aeronautical and maritime * * *." In the Frequency Allocations Table, RTCA separated the Aeronautical and the Maritime services. AOPA supported the submission of RTCA. However, RTCM supported the shared allocations.

133. There are various uncertainties in these frequency bands. The Aeronautical Mobile-Satellite (AEROSAT) experimental program is under development while the MARISAT has recently started providing operational service, both in the 1.5/1.6 GHz bands. No evidence has been submitted indicating that the development in the frequency bands above 40 GHz will take place in the foreseeable future. The requirements of the Aeronautical and the Maritime services are not known, making a logical apportionment of frequency bands between the two services difficult. It also appears that no irreparable harm will be done in retaining the shared allocations at the present time. Because of the Commission's participation in the RTCA and the RTCM it is unlikely as stated in the comments of ARINC, that "* * * the development of incompatible systems for aeronautical and maritime * * *" services would take place. The bandwidth of each of the shared allocations is more than the combined identifiable needs of the Maritime and the Aeronautical Services. We believe that the fear of any incompatibility and

[6] In the band 5000 to 5250 MHz frequencies between 5000.4 and 5020.1 MHz and between 5023.1 and 5033.1 MHz are planned to be used for Aerosat links from fixed stations to satellites; frequencies between 5232.2 and 5246.6 MHz and between 5209.3 and 5230.7 MHz are planned to be used from satellites to fixed stations.

the thesis put forth by ARINC that each service "• • • would require the full shared allocation • • •" are, at present, unfounded. Considering all the factors, we are retaining the shared allocations to the Aeronautical and the Maritime Mobile Services above 40 GHz, except for the 190–200 GHz band as mentioned in the Third Notice of Inquiry.

134. ARINC, ATA and RTCA recommended that the Aeronautical Mobile-Satellite service should be deleted and a footnote should provide for the use of space techniques in the Aeronautical Mobile service because a separate Aeronautical Mobile-Satellite service (1) "• • • is unwiedly (sic) from the frequency management and operational view points", and (2) imposes constraints regarding the need to develop separate coordination and registration procedures as distinct from the terrestrial service. AOPA supported the position of RTCA. COMSAT General opposed the proposal.

135. At present, there are many uncertainties surrounding the 1.5/1.6 GHz bands proposed for the AEROSAT experimental program. We are not aware of any terrestrial use of these frequency bands other than altimeters. Above 40 GHz, the frequencies are being allocated co-equally with the terrestrial and the satellite services providing flexibility of the use, if needed, of the same frequency for the terrestrial and space services. However, co-ordination with Maritime services would be required because the frequency bands are shared. Considering all the factors, we are proposing to retain the satellite services.

136. At the request of the proponents of the Aeronautical Mobile and the Aeronautical Mobile-Satellite services, the Route designator (R) was applied to the frequencies above 40 GHz allocated to them. In paragraph 113 of the Third Notice of Inquiry, the Commission specifically requested technical justification for the necessity of the Route or "R" designator. In the absence of any such justification, the "R" designator is being deleted.

Industrial, Scientific and Medical

137. Litton and Raytheon supported the proposals of the International Microwave Power Institute for ISM allocations which was provided through appropriate footnote; however, AT&T has opposed the proposal of footnote 410E, to permit the use of industrial, scientific and medical (ISM) radiators on 55 GHz±250 MHz because "• • • it would divide the breadth of contiguous bandwidth which makes the 54.25–58.2 GHz particularly attractive to common carriers."

This frequency band is attractive because, according to AT&T, it lies at the lower end of the 40–300 GHz range but is high enough to offer practically all the advantages of compactness of equipment, and because the technology developed now and in future for use of the band 59–64 GHz could be usable on it. AT&T suggested the use of a frequency near maximum oxygen resonance such as 60.2 GHz. The 25th harmonic of 2450 MHz, the frequency proposed to be used for Solar Satellite Power System (SSPS), is 61.25 GHz. We are proposing to reallocate the ISM emission from 55 GHz to 61.25 GHz±250 MHz.

Amateur/Amateur Satellite

138. The Amateurs generally supported the proposed allocations; however, a number of respondents urged us to make the 48–50 GHz band available to the Amateur and Amateur Satellite services. This band has been allocated to "safety of life" services, due to a re-alignment of the Table of Allocations to accommodate additional spectrum required for the Fixed-Satellite and Mobile-Satellite Services. For this reason, we are proposing to allocate the 49.8–50 GHz band to the amateur services.

Broadcasting

139. The Television Broadcasting Service Working Group reiterated its belief "• • • that the Broadcasting allocation should be retained • • •" in the 11.7–12.2 GHz band. We discussed this topic and rejected this proposal in paragraph 117 of the Third Notice of Inquiry in this docket. Since no new arguments have been put forth, our proposal remains unchanged.

Intersatellite

140. At the request of COMSAT, which was supported by AT&T, we are proposing to allocate the 21.4–21.7 GHz band in addition to the 22.7–23 GHz band to the Inter-Satellite service for providing simultaneous communications link in both directions. In paragraph 129 of the Third Notice of Inquiry, we invited information as to how these Inter-Satellite bands would be used in conjunction with foreseeable systems and discussion as to the reason for these two specific frequency bands. If no such justification is received, then we may be pressed to make these frequencies available to other services, with the subsequent deletion of the Intersatellite service from the Table.

Broadcasting-Satellite

141. The City College of the City University of New York (CUNY), JCET and CPB have requested that the 12.2–12.5 GHz band be allocated to the Broadcasting Satellite service in Region 2.

142. We have not made any assumption "• • • of equal channel distribution among all Region 2 countries • • •" as attributed to us by CUNY. If all community reception channels are assumed, as suggested by JCET and CUNY, then 3528 channels are projected from the Joint Industry Government Committee (JI/GC) Group B report for a 75% Broadcasting-Satellite case satisfying 2450 TV channels "market estimate" submitted by the Broadcasting-Satellite service working group. Even for a 50% Broadcasting-Satellite case, 2358 community reception channels are projected by the JI/GC report. The Broadcasting-Satellite working group originally postulated a 25% Broadcasting-Satellite case providing 1188 community reception channels and 131 Fixed-Satellites. We believe that this apportionment of the orbital arc between the two services is unrealistic because that number of satellites would provide an inordinately large number of channels, far in excess of foreseeable requirements in the 11.7–12.2 GHz band, for the Fixed-Satellite service. We used a cross-polarization system because that is more efficient and because its use was recommended by the JI/GC Group B.

143. No economic analysis has so far been submitted to us regarding the outlay and its sources for realizing the "market estimates" submitted. Because of the uncertainties associated with the forecasting of channels for social services, we are tentatively allocating the 12.2–12.5 GHz band to the Broadcasting-Satellite service provided the proponents of it submit reasonable criteria for sharing it with the Fixed and the Broadcasting Services.

144. Attention is also drawn to the proposal submitted for comment in the next section of this Notice (Fixed-Satellite). This allocation proposal shows the Broadcasting-Satellite Service as the only space service allocated in the 11.7–12.2 GHz band in Region 2. Several parties commented that the capacity estimates upon which additional spectrum was being requested for the Broadcasting-Satellite Service were based on a 25% use of the orbit by Broadcasting-Satellites as opposed to a 75% use by Fixed-Satellites. We do not necessarily agree with this analysis of the percentage of the orbit which would be consumed by each of these space services; however, comments are invited in two areas; 1) the feasibility and/or desirability of the allocation listed in the following section on Fixed-Satellites and 2) based on the various requirement estimates submitted, how much "exclusive" (only space service) spectrum in this range of the frequency spectrum is necessary to meet those requirements.

Fixed-Satellite

145. AT&T has objected to the proposed allocation of the 10.7–10.95 and 11.7–11.45 GHz bands to the Fixed-Satellite service. COMSAT General, COMSAT and RCA American Communications (RCA Americom) supported the proposal. COMSAT and RCA Americom stated that a contiguous frequency band entails economy. RCA Americom advocated the allocation of the 10.7–11.7 GHz band for domestic satellite system use also. (That portion of this band currently allocated to FX/SAT is limited to international systems by a domestic footnote. No such restriction exists in the international Table.)

146. Considering all the factors, we envision that the 10.7–11.7 GHz band will be confined to international use by the Fixed-Satellite Service with about half-a-dozen high density large diameter antenna earth stations located at places (such as Etam, Andover) away from the heavily populated areas of the United States. We would propose that these limitations be included in any future rulemaking proceeding. We believe that this allocation would provide flexibility to meet our future needs.

147. In the frequency bands 11.7–12.75, COMSAT, COMSAT General and Satellite Business System (SBS) raised several issues and submitted their proposals. COMSAT stated, and COMSAT General and SBS implied, that frequency division is more efficient that orbit division; this is contrary to technical recommendations* and the United States position represented in the just concluded 1977 World Broadcasting-Satellite Administrative Radio Conference (1977 WARC). The three parties recommended that 10.7–11.2 GHz bands should be allocated, in all Regions, to accommodate the earth-to-space requirements of the Broadcasting-Satellite service.

148. However, COMSAT and COMSAT General had already proposed the allocation of this 500 MHz band to accommodate the space-to-earth requirements of the Fixed-Satellite service. AT&T, in its reply comments has stated that "Bi-directional satellite operation is fraught with serious interference and other problems which are discussed in Report 557 of the International Radio Consultative Committee".

149. The proponents of these proposals have not submitted any analysis showing that the "bi-directional", as opposed to the "uni-directional", international Fixed-Satellite allocation provides more efficient use of orbit-spectrum. The space station of a Fixed-Satellite could use an earth coverage beam. What would the co-channel interference potential be from such a Fixed-Satellite space station to an adjacent Broadcasting-Satellite space station? Further, these proposals shift the frequency sharing of the earth-to-space transmission of the Fixed- and the Broadcasting-Satellite services in the 14.0–14.5 GHz band to the frequency sharing of the space-to-earth transmissions of the Fixed-Satellite service and the earth-to-space transmissions of the Boardcasting-Satellite service in the 10.7–11.2 GHz band. The proponents have not specifically identified, outside the presumption of the 14.0–14.5 GHz band, the frequency band of the earth-to-space transmissions of the additional 300 MHz of frequency of the Broadcasting Satellite service in Region 1.

150. SBS stated that the results of the 1977 WARC "* * * makes clear that the present allocations for use of the 12 and 14 GHz bands do not provide an adequate basis for the development of multiple fixed domestic satellite systems in these bands * * *". When such analysis is submitted it will be carefully considered.

151. We are not persuaded by the arguments in making drastic changes in this portion of the Frequency Allocation Table, particularly in Regions 1 and 3. In view of the possibility of an "a priori" orbital plan for the Fixed-Satellite service in the 11.7–12.2 GHz band and in view of the uncertainties of the forthcoming Region 2 conference, we would like to know the benefits and disadvantages of the following Region 2 allocations, along the lines suggested by JCET.

11.7–12.2 GHz..	Mobile (except aeronautical mobile). Broadcasting satellite.
12.2–12.5 GHz..	Fixed. Mobile (except aeronautical mobile). Broadcasting. Fixed satellite (space to Earth).
12.5–12.75 GHz.	Fixed. Mobile (except aeronautical mobile). Fixed satellite (space to Earth).

152. In the region between 13 and 15.5 GHz, we are not able to obtain a contiguous 1 GHz uplink. The 12.75–13.25 GHz was the only available frequency band for this purpose. We are further investigating this matter. The 250 MHz imbalance can be simply eliminated by allocating only 12.75–13.00 GHz for the Fixed-Satellite service. In practical life, earth-to-space and space-to-earth links are not as closely or simply related as some proponents would like. For example, the 14 GHz band of the INTELSAT-V satellite could be connected to either the 11 GHz or 4 GHz band.

153. We deleted the direction indicators from the Fixed and the Mobile-Satellite services above 40 GHz in the 3rd Notice of Inquiry. COMSAT General commented that ". . . the bands should be paired in an explicit manner in order to avoid utilization problems." We are now placing direction indicators on these two services. There is some imbalance, particularly at the higher portion of the spectrum, between the space-to-earth and the earth-to-space links. We are further studying this matter.

Standard Frequency Satellite

154. The following information on the Standard Frequency-Satellite Service is provided for information.

155. The National Bureau of Standards of the Department of Commerce (on behalf of the national laboratories including the Naval Observatory, Goddard Space Flight Center, Naval Research Laboratory, Johns Hopkins University and many universities and industry laboratories engaged in the research of precision frequency and time standards) has a need to exchange frequency and time to nanosecond precision at the present time and will require picoseconds precision within the time frame of the 1979 WARC. In addition, there is a demonstrated need for the international exchange of precise time and time intervals between laboratories to a higher order than presently achievable by the transporting of atomic clocks. In fact, there are a number of international standards laboratories, such as Australia, who now cannot contribute to the determination of the international second as determined by the Bureau International de l'Heures (BIH) in Paris due to the fact that flying a clock to make comparisons requires so long a period of time that the uncertainties in the clock being flown is greater than the variation between the two standards; the time scales presently associated with the reference standards between many administrations depart from uniformity by as little as 1 nanosecond in one day.

156. The 13.4–14.0 and 20.2–21.2 GHz bands have been identified in order to utilize existing hardware developments and present technology. The up and down links require an emission bandwidth of approximately 250 MHz and a coherently related integer functional frequency relation—the one selected here is 20/29. The proposed type of modulation will be a PRN digital code spread over approximately 250 MHz. The standard frequency community is proposing to utilize spread spectrum techniques using wide bandwidths to reduce the power levels of the satellite signals at the earth's surface to levels well below the levels of signals in the other services which share the band.

157. The 26 and 30 GHz bands have been identified for future development with a bandwidth requirement of about 1.2 GHz, a coherently related integer functional frequency relation of 22/25, and capable of achieving timing precision in the picosecond range.

Mobile Satellite and Fixed Satellite

158. AT&T inquired about the necessity of allocating frequencies to be shared by Mobile-Satellite and the Fixed-Satellite Services when separate allocations are already available in the Aeronautical Mobile-Satellite, Maritime Mobile-Satellite and Fixed-Satellite Services. There are intentions to use earth stations on maritime mobile vessels, on airborne platforms, and on land (with manpack equipment, with transportable systems, and at fixed points all at the same frequency. This kind of service, at present, cannot be provided by the existing allocations.

159. Both AT&T and COMSAT expressed doubts about the feasibility of sharing between the Mobile-Satellite Service and the Fixed-Satellite and the Fixed Services. AT&T recommended that any allocation to the Mobile-Satellite Service of frequencies used by a non-mobile service should be on a secondary basis.

160. The national requirement is for a primary allocation; as such, no secondary allocation is possible.

Several papers on this topic have been, and are being, submitted to the U.S. International Radio Consultative Committee Study Group 8C. The weakest communications link could be between two mobile low gain antenna, earth stations connected through a satellite. Geostationary satellites are expected to provide the mobile services with highly reliable communications links which could support a large volume of traffic. Critical needs of users are to be satisfied, although the orbit-spectrum efficiency, using traditional measures, could appear to be "low".

161. Some experimental work has been conducted above 20 GHz. Currently, an experimental/developmental system is operating in the 36–40 GHz band. Testing to date and the empirical analyses have shown the feasibility and desirability of operating satellite systems in the higher portions of the spectrum.

*RAND Report—1463, May 1974; Santa Monica, California.

Currently, we have under evaluation and development a satellite system which will use as a basis the experimental/developmental system in the 36–40 GHz. Implementation of this follow-on system is planned in the 1980's, with a total investment of approximately $1 billion. Accordingly, requirements include a Mobile Satellite allocation for the 20.2–21.2, 30–31, 40–41, 43–45, 76–79 and 81–84 GHz bands to accommodate the above and subsequent systems.

162. Considering all the factors, the shared allocations to the Mobile-Satellite and the Fixed-Satellite Services are proposed as indicated in the Table of Allocations. Following is a listing of current requirements for allocations to the shared Mobile-Satellite and Fixed-Satellite Services above 10.7 GHz. The requirement in the 102–105 GHz band is still under consideration.

GHz	*GHz*
20.2–21.2	50.4–51.4
30–31	76–79
40–41	81–84
43–45	102–105

Space Research/Earth Exploration Satellite

163. The following frequencies have been identified for the passive Space Research and Earth Exploration Satellite Services in order to permit remote environmental sensing operations.

GHz	*GHz*
10.6–10.7	86–92
15.2–15.4	100–102
17.7–17.9	105–126
19.7–19.9	150–151
21.2–21.44	164–168
22.21–22.5	174.5–176.5
23.6–24.0	182–185
31.3–31.8	200–201.5
36–37	225–240
50.2–50.4	250–252
51.4–59.0	275–277
64–65	

164. COMSAT and COMSAT General requested information on the characteristics, parameters and the potential impact of sharing of the Space Research and the Earth Exploration Satellite Services before they could comment on the shared allocations. The parameters of passive low-orbiting radiometers are listed in Tables 1A and 1B. In some cases geostationary satellites are envisioned, however, the radiometer bandwidth and the interference threshold would be identical with those of low orbiting satellites. The results of analyses performed by NASA to determine the feasibility of the passive services sharing with the Fixed and Fixed-Satellite Services are listed in Tables 2 and 3. The e.i.r.p.'s of the Mobile Service are the same as that of the Fixed Service, however a smaller size antenna is generally expected to be used by the Mobile Service. The frequency bands 21.2–21.4, 22.21–22.25, 36–37, 50.2–50.4, 54.25–58.2, 100–101, 116–126, 150–151, 164–168, 174.5–176.5, 200–201.5, 225–227, 250–252 and 275–277 GHz are included in the proposed Table of Frequency Allocations as we are assured that no restrictions would be placed on the active services sharing with the passive radiometer services. The allocations for passive radiometers in the bands above are predicated upon the assurance of nonrestricted operation of the active services.

165. In the balance of the identified frequency bands, where sharing between passive remote sensors and active services would exist, the following sharing criteria are proposed by NASA to prevent harmful interference to passive remote sensors.

166. In the band 10.6–10.7 GHz, the maximum equivalent isotropically radiated power of a station in the Fixed or Mobile service shall not exceed 35 dBW. The power delivered by a transmitter to the antenna of a station in the Fixed or Mobile service shall not exceed −3 dBW.

TABLE 1A

PASSIVE RADIOMETER PARAMETERS

FREQUENCY GHz	10.6 - 10.7	15.2 - 15.35	17.7 - 17.9	19.7 - 19.9	21.2 - 21.4	22.21- 22.5	36- 37
MEASURED PARAMETER	WATER, ICE, SNOW	WATER, RAIN	WATER	WATER SNOW, ICE	WATER	WATER VAPOR	RAIN, SNOW ICE
RANGE, DEGREES	-	-	-	-	-	-	-
SENSITIVITY °K	1	0.2, 1	0.2	0.2, 1	0.2	0.4	1
RESOLUTION Km	1 to 20	2, 1	2	1 to 20	2	2	0.2 to 2.0
INTEGRATION TIME, SECOND	.05 to .06	0.2, 0.01	0.2	0.03 to 0.2	0.2	0.02	.02 to 0.2
BANDWIDTH, MHz	90, 120	180, 195	180	120 to 210	180	405	115 to 920
SENSOR INTERFERENCE THRESHOLD dBW	-150, -155	-160, -153	-160	-160 to -152	-160	-153	-155, -145
SPACECRAFT ALTITUDE, KM	500	500	500	500	500	500	500
SPACECRAFT INCLINATION, DEGREES	70-110	70-110	70-110	70-110	70-110	70-110	70-110
SPACECRAFT ANTENNA, m	15	5	5	5	4	4	4

TABLE 1B

PASSIVE RADIOMETER PARAMETERS

FREQUENCY GHz	50.2-50.4 54.25-58.2	100-102	116-126	150-151	164-168	174.5-176.5 200-201.5	225-227	250-252	275-277
MEASURED PARAMETER	ATMOSPHERIC TEMPERATURE	H_2O OZONE	ATMOSPHERIC TEMPERATURE	H_2O	CHLORINE OXIDE	H_2O	H_2O, CO OZONE	H_2O	H_2O
RANGE DEGREES	-70 to +30	-	-	-	-	-	-		-
SENSITIVITY °K	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
RESOLUTION Km	2	2	2	2	2	2	1	1	1
INTEGRATION TIME, SECOND	1	1	1	1	1	1	1	1	1
BANDWIDTH, MHz	235	1850	1850	1850	1850	1850	1850	1850	1850
SENSOR INTERFERENCE THRESHOLD dBW	-157	-150	-150	-150	-150	-150	-150	-150	-150
SPACECRAFT ALTITUDE, km	500	500	500	500	500	500	500	500	500
SPACECRAFT INCLINATION, DEGREES	70-110	70-110	70-110	70-110	70-110	70-110	70-110	70-110	70-110
SPACECRAFT ANTENNA, m	1X6	1X6	0.75X3	0.5X2.5	0.5X2.5	0.5X2	0.4X1.5	0.4X1.5	0.4X1.5

TABLE 2A

SHARING ANALYSIS: FIXED SERVICE

FREQUENCY GHz	10.6 - 10.7	15.2 ANALOG	- 15.35 DIGITAL	17.7 - 17.9	19.7 - 19.9	21.2 21.4	22.21 - 22.5	36 - 37
TRANSMITTER POWER, dBW	0	13	-13	-13	-13	-13	-13	-6.5
FEEDER LOSS, dB	-	-	-4	-4	-4	-4	-4	-4
ANTENNA GAIN, dBi	38	45	43.5	43.5	43.5	43.5	43.5	43.5
e.i.r.p. dBW	38	58	26.5	26.5	26.5	26.5	26.5	33
TRANSMISSION BANDWIDTH, MHz			220	220	220	220	220	220
LINK LENGTH, Km		20	10	10	10	10	10	10
ATMOSPHERIC ABSORPTION, dB HORIZONTAL	--	5.6	5.6	9	17	30	+33	18
FADE MARGIN, dB	--		45	45	45	45	45	45
RADIOMETER ANTENNA SIDELOBE EFFECTIVE AREA dBm^2	-56	-59	-59	-60	-61.4	-62	-64	-67
RECEIVED INTERFERENCE, dBW	-157	-145.6	-177.1	-181.5	-191.4	-204.5	-207.5	-191
INTERFERENCE RELATIVE TO THRESHOLD, dB	+1	+14	-18.1	-21.5	-31.4	-51.5	-54.5	-45
SHARING FEASIBILITY	YES	NO	YES	YES	YES	YES	YES	YES

TABLE 2B

SHARING ANALYSIS: FIXED SERVICE

FREQUENCY GHz	50.2 - 50.4	54.25 - 58.2	116 - 126	150 - 151	164 - 168	176.5 - 176.5	200 - 201.5	225 - 227
TRANSMITTER POWER, dBW	-7.34	-6.0	-3.0	-0.7	0.3	+1.67	3.8	6.13
FEEDER LOSS, dB								
ANTENNA GAIN, dBi	43.5	43.5	45	45	45	45	45.5	45
e.i.r.p. dBW	36.2	37.5	42	44.3	45.3	46.7	49.3	51.1
TRANSMISSION BANDWIDTH, MHz	220	220	220	220	220	220	220	220
LINK LENGTH, Km	1	1	1	1	1	1	1	1
ATMOSPHERIC ABSORPTION, dB HORIZONTAL	100	100	70-100	>100	>100	> 100	> 100	> 100
FADE MARGIN, dB	45	45	45	45	45	45	45	45
RADIOMETER ANTENNA SIDELOBE EFFECTIVE AREA dBm^2	-69.4	-70.8	-72.1 (main beam)	0 (main beam)	-1 (main beam)	-1.3 (main beam)	-2.5 (main beam)	-3.7 (main beam)
RECEIVED INTERFERENCE, dBW	-272.4	-270.8	-164.7	-196.7	-195	-193.6	-192.7	-191.5
INTERFERENCE RELATIVE TO THRESHOLD, dB	-116.4	-113.8	-14.7	-44.7	-45	-44	-42	-41.5
SHARING FEASIBILITY	YES	YES	YES	YES	YES	YES	YES	YES

Table 3

SHARING ANALYSIS: FIXED-SATELLITE SERVICE

FREQUENCY GHz	17.7-17.9	19.7-19.9	150-151	164-165	225-227		
e.i.r.p. dBW	73.4	73.4	88	88	105		
FLUX AT EARTH SURFACE dBW/m^2	-88.6	-88.6	-75.0	-75.0	-58		
REFLECTIVITY FACTOR, dB	-3	-3	-3	-3	-3		
REFLECTION FROM EARTH dBW/m^2	-91.6	-91.6	-78.0	-78.0	-61		
AREA WITHIN RADIOMETER MAINLOBE dBm^2	63	63	86.7	86.7	86.7		
REFLECTED e.i.r.p., dBW	-18.6	-18.6	8.7	8.7	25.7		
SPREADING LOSS dBm^{-2}	-125	-125	-139	-139	-139		
FLUX AT RADIOMETER ANTENNA dBW/m^2	-143.6	-143.6	-130.3	-130.3	-113.3		
RADIOMETER ANTENNA AREA dBm^2	+10.5	+ 9.6	-15.7	-16	-19.8		
RECEIVED INTERFERENCE dBW	-133.1	-134	-146	-146.3	-133.1		

167. In the band 15.1–15.4 GHz, the maximum equivalent isotropically radiated power of a station in the Fixed or Mobile service shall not exceed 35 dBW. The power delivered by a transmitter to the antenna of a station in the Fixed or Mobile service shall not exceed —3 dBW.

168. In the band 17.7–17.9 GHz, the maximum equivalent isotropically radiated power of a station in the fixed or mobile service shall not exceed 40 dBW. The power delivered by a transmitter to the antenna of a station in the Fixed or Mobile service shall not exceed —3 dBW. The power flux density at the Earth's surface produced by emissions from a fixed-satellite space station for all conditions shall not exceed —109 dBW/m^2 in a 200 MHz reference band for all angles of arrival.

169. In the frequency band 19.7–19.9 GHz, the power flux density at the Earth's surface produced by emissions from a fixed-satellite space station for all conditions shall not exceed —108 dB W/m^2 in a 200 MHz reference band for all angles of arrival.

170. ARINC has opposed the addition of Space Research Service in the 14–14.3 GHz band without stating any reason. COMSAT stated that it would not oppose the allocation of the 14.4–14.5 GHz band to the Space Research Service on a permitted or secondary basis. We are modifying the allocation proposal, for these two bands, to a secondary service, subject to further evaluation.

171. AT&T has objected to the suggestion of an unrestricted Power Flux Density (PFD) in the 17.9–17.95 GHz band. AT&T believes that this unrestricted PFD would cause an excessive and intolerable time level of interference into a fixed service system at 18 GHz, such as AT&T's DR–18 terrestrial radio-relay system. Our proposal of unrestricted PFD in the 17.90–17.95 GHz band is withdrawn.

172. COMSAT commented on the inquiry about a definition of a "Space Radiolocation Station" in place of an "Active Sensor" designation. COMSAT stated that ". . it would seem that active space-borne Radiolocation devices would require extensive coordination and/or frequency assignment control in order to operate under the same allocation with terrestrial Radiolocation device without causing such interference." At this time, we are opposed to changing the definition. The requirements of this service are satisfied by specific allocations as identified.

172A. The frequency band 17.9–18.7 GHz has been identified for read-out of telemetry from meteorological satellites.

173. The following frequencies have been identified for Earth Exploration Satellite telecommunications links. The 17.9–19.7 GHz band has been identified for the space-to-earth link from a data relay satellite to a central data acquisition earth station. A bandwidth of 1800 MHz is required to accommodate the data transmission requirements of a data relay satellite serving multiple low orbiting earth exploration satellites.

174. The 27.5–30 GHz band has been identified for the earth-to-space link from the central data acquisition earth station to a data relay satellite as well as for the forward link from a data relay satellite to the low orbitting earth exploration satellite.

175. The 25.25–27.5 GHz frequency band is proposed for data from low orbitting earth exploration satellites to a data relay satellite.

176. Signal levels at the Earth resulting from transmissions over all data links would produce power flux density levels within the present power flux density limits.

177. The requirement in the 25.25–27.5 GHz band has been included in the proposed Table of Allocations. A new footnote 411A has been proposed in the Table to satisfy the requirements for space-to-space transmission in the 27.5–30 GHz band.

178. The requirements in the 17.9–19.7 and 27.5–30 GHz bands for radiocommunications between an earth station at a fixed point and a satellite can be satisfied by the existing allocations in Fixed-Satellite Service. For clarification, the Earth Exploration Satellite Service can be added to the other services listed as examples in the Radio Regulation 84 AG.

MOD Fixed-Satellite Service

84AG 8pa2.. A radiocommunication service:
Between earth stations at specified fixed points when one or more satellites are used; in some cases this service includes satellite-to-satellite links, which may also be effected in the inter-satellite service;
For connection between one or more earth stations at specified fixed points and satellites used for a service other than the fixed-satellite service (for example, the mobile-satellite service, broadcasting-satellite service, earth exploration-satellite service, etc.).

Radio Astronomy

179. The Radio Astronomy Service Working Group (RASWG) and the National Academy of Sciences commented on the Radio Astronomy service allocations. The RASWG requested sharing the band 14.5–15.35 GHz on a primary basis with Space Research. Footnote 408B provides for a secondary allocation to the Space Research service in the space-to-earth direction. Transmission is already planned by the Tracking and Data Relay Satellite in the major portion of this band ruling out any possibility of sharing it with the Radio Astronomy service. We are proposing to add the restriction "except aeronautical mobile" in the frequency bands 22.21–22.5 GHz and 217–230 GHz as requested by the RASWG. We are also proposing to add the footnote 412H in the 48–50 GHz, 95–101 GHz and 142–150 GHz bands as required by RASWG for observation of three carbon monosulfide lines. The footnote 412M is being modified, as requested by RASWG, to include the frequency 140.840 GHz for observation of the formaldehyde line, and we are deleting the footnote MOD 412J from the frequency bands 217–220 GHz and 220–221 GHz as it is inappropriate. The National Academy of Sciences considered the needs of the space research services, noted that "clear" bands allocated for use by passive sensors aid the Radio Astronomy service, and supported the proposals for such bands. Both the RASWG and the National Academy of Sciences noted the potential for problems of interference from adjacent bands and recommended that the harmful interference limits defined in CCIR report 224–3 be taken into account in planning for adjacent band usage.

Fixed/Mobile (including Auxiliary Broadcast)

180. Referring to the frequency band 11.7–12.2 GHz, the Auxiliary Broadcasting Service Working Group (SWG) stated that "There is no need to reduce the Mobile Service to secondary status." The co-equal sharing of the Mobile, and the Broadcasting- and the Fixed-Satellite services in the same service area is practically impossible and we disagree with thesis put forward by the Auxiliary Broadcasting SWG.

181. The Auxiliary Broadcasting SWG stated that "It would be expected that 12.2–12.5 MHz (sic) could be shared on a secondary basis." This is a domestic issue. As we are not proposing deletion of the international allocations, the subject will not be discussed further.

182. The Auxiliary Broadcasting SWG opposed the proposed allocation of the 12.75–13.25 GHz band to the Fixed-Satellite service and stated that "• • • no other services be permitted to share the 12.70–13.25 GHz band with the Television Auxiliary Broadcasting Services". Since this particular band was the only one that appeared to be available to satisfy the Fixed-Satellite uplink requirement, we are unable to comply with this request. However, restrictions on the Fixed-Satellite service, similar to those mentioned in the Fixed-Satellite section for the 10.7–11.7 GHz band, would be considered if so proposed. In the 12.75–13.25 GHz band, it is not certain if the electronic news gathering transmissions would interfere with the space station receiver or not. The typical ranges of parameters of the mobile electronic news gathering system are as follows:

Maximum transmitter power, dBW, −20 to 0
Antenna diameters, 3" to 2'
Antenna gain, dBi, 20 to 35.5
Modulation, FM
BW, MHz, 25
Link, Length, miles, 0.5 to 5
Receiver Noise Figure, dB, 8
Sound Subcarrier(s), Two

183. Comments are invited on the sharing criteria between the electronic news gathering systems and the space stations, and on the level of the interference, if any, that would be introduced to the space stations by the current parameters of the electronic news gathering systems. Considering the answers to the above questions, along with any other pertinent information before us, we will carefully review the situation during domestic Rulemaking proceedings.

184. Referring to the frequency bands 17.7–19.7 GHz, 21.2–22, 22.4–23 GHz and 37–40 GHz, the Auxiliary Broadcasting SWG urged "• • • the Commission to permit no footnote to be associated with these bands which would preclude their use for Television Auxiliary Stations". If this SWG submits any analysis showing a particular footnote to be detrimental to the Television Auxiliary Stations, then we will consider those comments.

Radionavigation/Radiolocation

185. These services in the bands above 10.7 GHz were only nominally addressed in the comments and reply comments to the Third Notice of Inquiry. Specific comments included the deletion of footnote 407A from the 13.25–13.4 GHz band, deletion of footnote 408A from the 14–14.3 GHz band, and support for addition of a new footnote 409CA in the band 15.7–16.6 GHz. In addition, the RTCA and ARINC supported the retention of the Radionavigation allocations at 31.8–32.3 GHz and 33–33.4 GHz.

186. The ARINC and RTCA request for suppression of of footnote 408A in the band 14–14.3 GHz has been opposed by COMSAT in its reply comments, "unless CCIR Recommendation 496 (concerning frequency sharing criteria) is incorporated in the International Radio Regulations". This band will be used by the INTELSAT system and by the SBS system for the uplink to their satellites. Such systems require huge investments and must be protected. We, therefore, cannot accept the deletion of footnote 408A at this time. We do, however, invite comment on the sharing criteria which could be adopted in lieu of footnote 408A, if such criteria are deemed perferable to footnote 408A.

187. ARINC proposed the deletion of the footnote 407A from 13.4–14.0 GHz band without giving any reason. The footnotes 407A and 408B are proposed to be deleted and the secondary Space Research Service is proposed to be allocated in the Table to meet our national requirements. Except for the 14.4–14.5 GHz band, the direction indicators for the Space Research Service, in this region of the spectrum, are deleted. Because of the secondary status of the proposed allocations to the Space Research Service, no interference is expected to be caused by it to the other services.

Above 40 GHz

188. COMSAT commented that we may desire to leave a large portion of the frequency band above 40 GHz unallomade at this time • • •." The private cated but request a conference in the late 1980s to make specific allocations. COMSAT General had previously recommended certain frequency bands above 40 GHz for the fixed-satellite service. COMSAT General proposed that "• • • no other allocations above 40 GHz be made at this time • • •" The private microwave advisory committee stated its belief that allocations above 100 GHz should be left "open" to insure future flexibility. AT&T recommended "• • • that the Commission continue to press for international allocations of the spectrum from 40 to 300 GHz to encourage experimentation and innovative development." Several arguments, any of which is persuasive, can be made for proposing specific allocations above 40 GHz. First, a large portion of the spectrum above 40 GHz is currently allocated; other Administrations may be expected to propose allocations for the frequency bands currently unallocated, and the United States should be prepared for that eventuality. Second, many spectral lines have been identified for the Radio Astronomy and Space Research services. Third, developments are currently in progress in several frequency bands above 40 GHz. Fourth, the allocations table helps users to select the appropriate frequency for the development of a specific service, thus preventing waste of funds. Fifth, and perhaps most importantly, orderly spectrum development ensues. The last General World Administrative Radio Conference (GWARC) was held in 1959 and at that time the entire Article 5 was considered. The World Administrative Radio Conferences held between 1959 and the present were "specialized" in nature and devoted to specific services such as Space, Maritime, and Broadcasting-Satellite. We are not certain that another GWARC could be convened in the late 1980s as suggested by COMSAT. Considering all factors, we believe it prudent to prepare a specific Frequency Allocations Table extending up to 300 GHz.

189. Various lasers systems are currently being developed for radar, and for terrestrial and satellite communications. What, if any, allocations and technical regulation should be proposed for these frequencies?

International Radio Regulations and Appendices

190. Although the published Agenda for the 1979 WARC specifies Articles of the Radio Regulations which are to be considered, we are reviewing all Articles and Appendices in order to determine the appropriate actions to take in their regard. For purposes of discussion, we have divided the Articles and Appendices into those dealing with definition matters, technical matters, and operational matters. Some proposals pertaining to these matters were presented in the previous Notice; additional proposals arising to this time are presented in Appendix 3.

Definition Matters

191. We have identified a requirement for accommodating spaceborne radars such as docking and mapping radars used in space programs. We have considered modifying the definition of the Radiolocation Service to include spaceborne operations, however, at this time we are opposed to this subject and we may propose specific allocations in future to satisfy this requirement.

Technical Matters

192. Spectrum requirements are far beyond the ability of usage concepts to provide. There is simply not enough usable spectrum for exclusivity. To determine which services should be sacrificed at the expense of another, would, in most cases, be a difficult task. Initially at least, it must be assumed that, with few exceptions, all services must be regarded as coequal.

193. We ask all users to recognize the impossibility of obtaining all the spectrum requested and the virtual impossibility of exclusivity with perhaps several exceptions. We must develop conditions for cooperative use which go far beyond the concepts of sharing that presently prevail. Given that a band must be used by more than one justifiable service, our problem is to determine

the specific conditions or criteria, which can be applied to two or more services on mutually cooperative rather than mutually exclusive bases in order to achieve more effective use of the spectrum.

194. The need for cooperative use of the spectrum (as evidenced by the projected demands for existing services and expected growth of new services) is greater than ever envisaged before by more than an order of magnitude.

195. We ask that interested parties address themselves to the conditions under which they can cooperate with other services that must make use of the same portions of the spectrum.

196. A number of problem areas concerning cooperative use have been identified as being of great importance. We solicit comments on these problems (see Problem Areas) and we suggest that the replies take cognizance of the following key issues which underlie the development of increased sharing through "Cooperative and Mutual Usage" criteria:

Key Issues

(1) Is there a case for exclusivity as far as particular bands or frequencies are concerned?

(2) Is the need for the service in a requested band such that increased sharing through cooperative and mutual usage criteria should be developed, or would the service suffer serious harm by virtue of such usage?

(a) Exactly how does the service make us of the band (for which increased sharing through cooperative and mutual usage are to be developed)? The answer should be couched in terms of radiation patterns, size of markets, use as a function of population density, geographical location, time of day, expected physical coverage by radiated signal, frequency sharing, and any other related pertinent factors. In particular, consideration should be given to the probability statistics of use, and tolerable interference, since less than 100% uninterrupted service may be a necessary factor in the increased sharing through cooperative and mutual usage criteria.

(b) Which factors, specifically relevant to the above usage, would have to be addressed in order to develop increased sharing through cooperative and mutual usage criteria?

(3) Do the existing Radio Regulations concerning interference aid or interfere with the determination of increased sharing through cooperative and mutual usage criteria? If so, in what way, and what modifications would be helpful?

(4) Are there preferred technical and operating characteristics of a service, or of services for which it is necessary to develop increased sharing through cooperative and mutual usage criteria? For instance, would specific attention to such factors as antenna characteristics, transmitted power, flux density, type of emission, receiver characteristics, TASI, etc. for a given system, or equipment, not presently specified in detail, permit greater usage of the band by the several necessary services?

(5) Would cooperative use be enhanced by specific rules and regulations which do not presently exist, and what would such rules cover?

(6) In the event that special coordination procedures would be helpful for increased sharing through cooperative and mutual usage, what form would these take? Finally, what would such procedures be able to accomplish that cannot be accomplished under the present operating structure?

(7) Can requests for various segments of the bands be coordinated in some form of priority? For instance, if a service must be expanded, is greater priority to be given to new bands, or expansion of existing bands? If increased sharing through mutual and cooperative usage criteria must be employed, what other services are the most and the least desirable for mutual usage? Is a single wide band used in cooperation with other services, preferable to a number of smaller bands with perhaps less interference potential? Where is it contemplated that such bands should lie? Are other factors pertinent?

(8) In what way do modulation techniques, e.g. digital, FM, spread spectrum, etc., affect the increased sharing through cooperative and mutual usage?

197. We wish to approach this problem with the positive outlook that at least partial solutions are available if only we search diligently enough.

198. With these thoughts in mind, particular problems of band usage are here brought to the specific attention of those users who are involved. These matters are also addressed in the text of this Notice of Inquiry either in terms of service or spectrum bands or both. However, because they pose particularly severe difficulties as far as resolution is concerned, they are presented below. We request that the various users suggest criteria/conditions for increased sharing through cooperative usage, with particular reference to the preceding statements:

Problem Areas

(1) Usage of the 3.4–6.925 GHz band by the Broadcasting-Satellite Service, Fixed Satellite Service, and mobile users. (See Appendix 5.)

(2) Mutual usage by Mobile and Radiolocation Services in the 896–902, and 941–947 MHz bands. There are also potential problems with troposcatter and broadcasting. (Technical Parameters of Radiolocation Service are listed in the common carrier Land-Mobile Section, page 20.)

(3) Broadcasting and Radiolocation services in the 1615–1800 kHz band require consideration.

(4) Usage of the 4–30 MHz band by HF Broadcasting and Fixed/Mobile services, Maritime Mobile Service sharing with secondary Fixed Service in accordance with the Note described in the HF Fixed section, page 9.

(5) Usage of the 821–825 MHz and 866–870 MHz bands for Mobile Satellites—interference with TV, land mobile and other services requires consideration. (See footnote 329B.)

(6) Usage of 2300–2500 MHz band. Required for Broadcasting-Satellite Service, along with requirements of Aviation and Marine related services.

(7) A 1% bandwidth is requested for radio astronomy research in the 3 GHz region. At present it is not clear where this may be best provided. (See footnote 369A.)

Operational Matters

199. Operational matters are those which are left after the Table of Frequency Allocations, technical matters and notification provisions are excluded. Numerous topics which would fall within the purview of the operations committee which may be established at the 1979 WARC are treated in Appendices 3 and 4 of this document. In many instances where the intent of the proposed MOD or ADD is not self-evident, a tentative reason has been shown.

200. There is not intent to expand the agenda as presently adopted by the Administrative Council. These matters go beyond the scope of the draft agenda for the 1979 WARC already adopted pursuant to the provisions of the Convention. However, that Convention does provide for the amendment of draft agendas already established. Since there will be three meetings of the ITU Administrative Council prior to the Conference, and since the Council may initiate adjustment of, or expansion of, the agenda, we are here endeavoring to prepare should matters not now slated for consideration perhaps suddenly be added to the agenda. Were an expansion effected in, say, June of 1979, the Commission would not then have time, in all probability, to issue a notice of inquiry prior to the convening of the WARC on September 24, 1979.

201. Rather, noting the provisions of the Administrative Procedure Act, we would prefer to invite attention to these matters now while there is some time to benefit from public comment thereupon. It should also be noted that portions of these appendices were produced very late in the preparation of this notice and therefore have not been reviewed in their entirety by all appropriate elements in the preparatory structure. When that total review is effected, some may be altered or removed and others may be added as is true for all matters advanced herein. With this in mind, cogent comment upon the proposals advanced is requested with the hope that commenters will bear in mind that this is not a domestic proceeding, and that the scope of the proceeding extends well beyond 1977.

Resolutions and Recommendations

202. We are reviewing all Resolutions and Recommendations in order to determine the appropriate actions to take in their regard. The proposals arising to this time are presented in Appendix 4; additional proposals will be presented in future Notices. In some cases we are proposing no action. In other cases, the proposals will depend on the outcome of events at the 1979 WARC or in the period between today and the time of

the 1979 WARC; these cases are discussed below.

203. The principles mentioned in Resolution 3 and Recommendation 37 are still valid; it may be appropriate for a new Resolution setting forth present and future techniques and calling upon administrations to utilize those techniques to reduce congestion in the band 4 MHz–27.5 MHz.

204. Resolution 10 needs to be modified if the bands 7000–7100 kHz and 7100–7300 kHz are revised; in any event, the concept of sharing HF bands by certain services, e.g., Fixed and Broadcasting, may dictate modifications if sharing is decided to be a feasible concept.

205. Resolutions Mar 5 and Mar 2–20 are related and will need to be updated by the 1979 WARC; the modifications will be further dependent upon proposals considered by the 1979 WARC.

206. Resolution Mar 2–5 can be suppressed provided that the ITU Secretary General has published in the List of Coast Stations the Distribution Plan for Group Channels—HF Al Morse.

207. Recommendation 31 relates to the protection of standard frequency guard bands for use by radio astronomy; if incorporated into a footnote in the Radio Regulation, then the Recommendation could be suppressed.

208. Recommendation Mar 2–1 can be suppressed if the WARC provides allocations for low power radiolocation.

209. The actions required on Recommendations Mar 2–8 and 2–9 depend upon the actions of the WARC with regard to allocations proposals for the Maritime Mobile service and further with regard to how that spectrum is divided among the various maritime users.

210. Recommendation Mar 2–11 can be suppressed if the WARC makes available additional UHF frequencies for onboard ship communications. There is a relevant CCIR Draft Report (No. 587, Rev 76) dealing with question 18–118.

211. Recommendation Spa 2–1 is likely to be suppressed by the 1979 WARC.

212. The actions on Recommendations Spa 2–3, Spa 2–4, Spa 2–5 are dependent upon the actions of the WARC with regard to appropriate allocations. It is likely that these Recommendations will be suppressed.

213. The action on Recommendation Spa 2–7 is dependent upon the actions of the WARC with regard to allocation proposals for the Radio Astronomy service.

Conclusion

214. As we have previously indicated in this proceeding, all participants should keep in mind the importance of the 1979 WARC results. Based upon past experience, decisions reached at this conference can be expected to provide the basis for international radio regulation policy for most of the remainder of this century. It is of the utmost importance to develop U.S. proposals which effectively promote that combination of telecommunication uses which offers the maximum social and economic contribution to the national welfare and which also contain the flexibility necessary to accommodate important new applications of this dynamic technology as well as the unique requirements of our international partners in the ITU. It must be recognized that the proposals presented herein pertain to the international Radio Regulations and that the domestic implementation of such proposals will require extensive U.S. national consideration.

215. Comments bearing on the proposed revisions to the international Radio Regulations, Appendices, Resolutions, and Recommendations, and any other matters relevant to preparation for the 1979 WARC are hereby sought from all interested United States individuals, parties, or groups of parties which may exist. In order to facilitate our analysis of the comments, we are asking that they be organized according to the topics presented in this Notice.

216. Pursuant to applicable procedures set forth in Section 1.415 of the Commission's Rules, interested persons may file comments on or before August 1, 1977, and reply comments on or before August 22, 1977. All relevant and timely comments and reply comments, along with any pertinent information which we may have available, will be considered. When commenting, it should be borne in mind that this effort is directed toward international allocations and not domestic issues. The U.S. wants to achieve maximum flexibility in international allocations proposals.

217. Although § 1.419 of the Commission's rules required that an original and five copies of all statements, briefs, or comments be filed in response to a Notice, our conference preparatory organization necessitates the filing of an orignal and nineteen copies. All responses received will be available for public inspection during regular business hours in the Commission's Public Reference Room at its Headquarters in Washington, D.C.

218. This Notice is issued pursuant to the authority set forth in section 4 (i) of the Communications Act of 1934, as amended 47 U.S.C. 154(i).

FEDERAL COMMUNICATIONS COMMISSION,
VINCENT J. MULLINS,
Secretary.

APPENDIX 1.—RESPONDENTS TO THIRD NOTICE OF INQUIRY

COMMENTS RECEIVED IN RESPONSE TO THIRD NOTICE OF INQUIRY—DOCKET 20271

Aeronautical Radio, Inc. and the Air Transport Assoc. of America
Aerospace & Flight Test Radio Coordinating Council
Aircraft Owners & Pilots Association
AM Broadcasting Service Working Group
American Broadcasting Companies, Inc.
American Telephone & Telegraph Co.
American Waterways Operators, Inc.
Association of American Railroads
Association for Broadcast Engineering Standards
Association of Independent Television Station, Inc.
Association of Maximum Service Telecasters, Inc.
Auxiliary Broadcasting Service Working Group
Clear Channel Broadcasting Service
Communicasting Assoc. of America, Inc.
Communications Satellite Corporation
COMSAT General Corp.
Corporation for Public Broadcasting
Council for UHF Broadcasting
Decca Survey Systems, Inc.
Domestic Land Mobile Advisory Committee
E. I. Du Pont de Nemours & Co.
Electronic Industries Assn. (Consumer Electronics Group)
Family Stations, Inc.
Far East Broadcasting Company, Inc.
Farinon Electric
Fisher's Blend Station, Inc.
General Electric Company (Communications Systems Div.)
General Electric Company (Major Appliance Business Group)
Gilmore Broadcasting Company
GTE Service Corp.
Guy, Arthur W.
Haddock, Hoyt S.
Hazeltine Corporation
Health, Education & Welfare Dept.
Joint Council on Educational Telecommunications
Krebs, William N.
Land Mobile Communications Council
Litton Microwave Cooking Products, Inc.
Marsten, Richard B.
Medallion Broadcasters, Inc.
Metromedia, Inc.
Mobile Marine Radio, Inc.
Motorola, Inc.
National Academy of Sciences
National Association of Broadcasters
National Astronomy and Ionosphere Center
National Broadcasting Company, Inc.
National Radio Broadcasters Association
Odom Offshore Surveys, Inc.
Offshore Navigation, Inc.
Private Land Mobile Service Working Group
Private Microwave Advisory Committee
Public Broadcasting Service
Public Service Satellite Consortium
Radio Astronomy Service Working Group
Radio Technical Commission for Aeronautics
Radio Technical Commission for Marine Services
Raytheon
RCA American Communications, Inc.
RCA Global Communications, Inc.
Satellite Business Systems
Television Broadcasting Service Working Group
Thompson, Arthur
Trans World Radio and Trans World Radio Pacific
Utilities Telecommunications Council
WGN Continental Broadcasting Company
International CB Radio Operators Association
E. F. Johnson Company

COMMENTS TO THIRD NOTICE OF INQUIRY—DOCKET 20271 (AMATEUR)

Amateur Radio Advisory Committee
American Radio Relay League
Arbogast, Burl T.
Argonne Amateur Radio Club
Bayalis, John
Beacon Radio Amateurs
Berberich, Frank
Bidstrup, Scott C.
Big Island Amateur Radio Club
Bowen, Chuck
Bowles, William G., Jr.
Cambridge, Ohio Amateur Radio Club
Carlen, Ed
Carlson, C. R.
Choisser, Bill and Kenney, Lawrence
Citrus Center Amateur Radio Club
Clark, Rev. Benjamin
Cooke, Willis E.
Davis, Marshall B.
Duck, Edward E.
East Bay Radio Club
Edgewood Amateur Radio Society, Inc.

Electronic Industries Association (Communications Division)
Emergency Amateur Radio Club
Enid Amateur Radio Club, Inc.
Erk, Peter
Evans, James J.
Eye, Louis D., II
Fisher, James W.
Fisher, Walter
Fountain City Amateur Radio Club
Fulton County Amateur Radio Club
Fort Belvoir Amateur Radio Club
Fulcher, William, N.
Gainesville Amateur Radio Society
Great Smoky Mountain Chapter of 10–X
Greater Fairfield Amateur Radio Association
Grew, William
Guenther, John
Groenhof, Henry
Gulino, Chick
Gundry, James A.
Heimberger, Raymond E.
Henselman, Ronald
Hodges, Louis A.
Hauck, Ray N.
Houston, Al
Knirko, Lee
Larkin, Clarence J., Jr.
Leopold, Hank
Letovrneau, Wayne
Lievsay, Claude, Jr.
Long Island Mobile Radio Club
Magro, Daniel, Jr.
May, Robert M. II
Mitchell, W. M.
Moss, James
National Capitol DX Association
Pagliarini, John A., Jr.
Paruolo, Emil
Pentagon Amateur Radio Club
Praig, G. Franklin
Preston, James C.
Quarter Century Wireless Association Inc. (Long Island Chapter)
Radio Amateur Club of Knoxville
Radio Amateur Megacycle Society
Radio Amateur Satellite Corporation
Reiter, Verlin E.
Reynolds, Howard W.
Rock Creek Amateur Radio Association
Rudd, F. A.
Ruh, Henry B.
Scheurer, J. R.
Scholtz, William
Shreve, R. B.; Mclaren, Donald; Hinds, George; Carson, Willard; Hollis, Dave
Spearman, Frank
Springer, Alfred E.
Stitzer, Steven N.
Texas VHF-FM Society Inc.
Thompson, Andrew F.
Thornton, Douglas
Tiffany, W. D.
Troster, John G.
Southern California Repeater & Remote Base Association
Tucson Repeater Association
West, Bryan F.
Winona Amateur Radio Club
Wolf, John

APPENDIX 2.—PROPOSAL FOR INTERNATIONAL TABLE OF FREQUENCY ALLOCATIONS (ARTICLE 5)

METHOD OF PRESENTATION

1. Numbers shown are the international Radio Regulation numbers;

2. Underlining indicates new text;

3. If a service is in all Capitals, it is a primary service (e.g. MOBILE);

4. If a service has a Capital as the first letter, and the remainder in lower case, it is a secondary service (e.g. Mobile);

5. Slant bars before and after service indicate a permitted service (e.g. /Mobile/);

6. ADD means an addition to the current provisions;

7. Brackets through the text (e.g., [ ]) indicate existing text which is being deleted;

8. MOD means a modification of the current provisions;

9. SUP means to suppress the current provisions;

10. NOC means we are proposing that the current provisions not be changed;

11. In view of the action taken by the Final Acts of the 1971 Space Conference all frequencies should be expressed in hertz instead of cycles per second;

12. The absence of MOD, SUP OR NOC against a given Radio Regulation means that no proposal is being made in respect to that provision.

TABLE OF ALLOCATIONS

kHz

Region 1	Region 2	Region 3
Below 10	(Not allocated) 157	
REASON: No allocations to services proposed. NOC 157 REASON: There is a continuing need for this condition in the event that frequencies below 10 kHz are used for special national purposes.		
10-14	RADIONAVIGATION Radiolocation	
Reason: There is continuing and expanded use of this frequency band for worldwide radio navigational systems (Omega) for maritime and aeronautical aids. Radiolocation is being deleted to protect radionavigation systems, and to preclude the entry of incompatible systems in the future.		
14-19.95	FIXED MARITIME MOBILE 158 159	
19.95-20.05	STANDARD FREQUENCY 160 159	
20.05-70	FIXED MARITIME MOBILE 158 159 161	

kHz

Region 1	Region 2	Region 3
70-72 RADIONAVIGATION 162 161	70-90 FIXED MARITIME MOBILE 158 MARITIME RADIONAVIGATION 162 Radiolocation	70-90 FIXED MARITIME MOBILE 158 RADIONAVIGATION 162
72-84 FIXED MARITIME MOBILE 158 RADIONAVIGATION 162 161 163		
84-86 RADIONAVIGATION 162 163		
86-90 FIXED RADIONAVIGATION 162 MARITIME MOBILE 158 163	164	165
Reason: Operational requirements remain constant.		

kHz

Region 1	Region 2	Region 3
90-110 Fixed ~~FIXED~~ ~~MARITIME MOBILE 158~~ RADIONAVIGATION Maritime Mobile 158 163 166 167	90-110 RADIONAVIGATION Fixed Maritime Mobile 158 166 167	90-110 ~~FIXED~~ ~~MARITIME MOBILE 158~~ RADIONAVIGATION Fixed Maritime Mobile 158 166 167

REASON: To provide primary allocation for the radionavigation service worldwide.

NOC 166

REASON: Applicable to the contemplated use of this band for worldwide radionavigation systems. Affords additional protection.

kHz

Region 1	Region 2	Region 3
110-112 ~~FIXED~~ MARITIME MOBILE RADIONAVIGATION 162 163 167 ~~168~~	110-~~130~~ 115 ~~FIXED~~ MARITIME MOBILE MARITIME RADIONAVIGATION 162 Radiolocation 164 167 ~~168~~	110-130 ~~FIXED~~ MARITIME MOBILE RADIONAVIGATION 162
112-115 RADIONAVIGATION 162 163	115-130 ~~FIXED~~ MARITIME MOBILE MARITIME RADIONAVIGATION 162 BROADCASTING Radiolocation	
115-126 ~~FIXED~~ MARITIME MOBILE RADIONAVIGATION 162 163 167 ~~168~~ 169		
126-129 RADIONAVIGATION 162 163		
129-130 ~~FIXED~~ MARITIME MOBILE RADIONAVIGATION 162 163 167 ~~168~~	164 167 ~~168~~	167 ~~168~~ 170

REASON: To provide for low frequency broadcasting.

SUP 168

REASON: No longer required.

5.

kHz

Region 1	Region 2	Region 3
130-150	130-150	130-150
MARITIME MOBILE 172 Fixed	FIXED MARITIME MOBILE BROADCASTING	FIXED MARITIME MOBILE
163, 167 173	167	167
150-160	150-160	150-160
MARITIME MOBILE 167 174 BROADCASTING	FIXED MARITIME MOBILE BROADCASTING	FIXED MARITIME MOBILE
175	167	167
160-255	160-200 190	160-200
BROADCASTING	FIXED 179 BROADCASTING 179	FIXED Aeronautical radionavigation
176	190-200 FIXED AERONAUTICAL 179 RADIONAVIGATION	
	200-285 275 AERONAUTICAL RADIONAVIGATION Aeronautical mobile	
255-285 275 MARITIME MOBILE 174 BROADCASTING AERONAUTICAL RADIONAVIGATION 176 177 178		

REASON: Broadcasting added 130-190 kHz to provide for low frequency broadcasting. Aeronautical radionavigation added 190-200 kHz band to accommodate the growing needs of this service.

6.

kHz

Region 1	Region 2	Region 3
275-285 MARITIME MOBILE 174 BROADCASTING AERONAUTICAL RADIONAVIGATION Maritime radionavigation (radiobeacons) 176 177 178	275-285 AERONAUTICAL RADIONAVIGATION Aeronautical mobile Maritime radionavigation (radiobeacons)	

Reason: To support requirements for maritime radiobeacons.

kHz

Region 1	Region 2	Region 3
285-315	MARITIME RADIONAVIGATION (radiobeacons) Aeronautical radionavigation	

REASON: There is a continuing need to utilize this band for radionavigation (radiobeacons).

315-325 AERONAUTICAL RADIONAVIGATION 180	315-325 MARITIME RADIONAVIGATION (radiobeacons) Aeronautical radionavigation	

Reason: There is a continuing need to utilize this band for radionavigation (radiobeacons).

325-406 335	Maritime radionavigation (radiobeacons) AERONAUTICAL RADIONAVIGATION Aeronautical mobile 181	

Reason: There is a continuing need to utilize this band for aeronautical radionavigation and aeronautical mobile, and to support requirements for maritime radionavigation beacons.

335-405	AERONAUTICAL RADIONAVIGATION Aeronautical mobile 181	

Reason: There is a continuing need to utilize this band for aeronautical radionavigation and aeronautical mobile services.

kHz

Region 1	Region 2	Region 3
405-415 MOBILE except aeronautical mobile AERONAUTICAL RADIONAVIGATION MARITIME RADIONAVIGATION (radio direction-finding) 182 183 184	405-415 MARITIME RADIONAVIGATION (radio direction finding) /Aeronautical radionavigation/ Aeronautical mobile 182	405-415 RADIONAVIGATION Aeronautical mobile 182

REASON: There is a continuing need for the services specified above in this band.

NOC 182

REASON: There is a continuing need to provide the maritime radionavigation (radio direction-finding) service with protection from interference from other services utilizing this band.

kHz

Region 1	Region 2	Region 3
415-490		
MARITIME MOBILE		
185 186		

REASON: There is a continuing need by the maritime mobile service to utilize this band for telegraph communications over short and medium distances.

490-510		
MOBILE (distress and calling)		
187		

REASON: There is a continuing need to maintain this band for international distress traffic and calling purposes.

NOC 187

REASON: Same as indicated above.

kHz

Region 1	Region 2	Region 3
510-525	510-525	510-525
MARITIME MOBILE 186 188A Aeronautical radionavigation 188	~~MOBILE~~ /Aeronautical radionavigation/ 188 MARITIME MOBILE 186 188A	MARITIME MOBILE 188A Aeronautical mobile Land mobile
185		189

REASON: Mobile allocation deleted and maritime mobile allocation (and appropriate footnote) inserted to conform to actual usage of band.

NOC 188

REASON: To retain priority for the maritime mobile service in this band on a worldwide basis.

ADD 188A The frequency 512 kHz is used as prescribed by Nos. 1123 and 1125 through 1129.

Reason: To indicate 512 kHz is used in accordance with provisions of Article 32.

kHz

Region 1	Region 2	Region 3
525-535	525-535	525-535
BROADCASTING	~~MOBILE~~ ~~Broadcasting 191~~ ~~Aeronautical~~ ~~Radionavigation 188~~ BROADCASTING	~~MOBILE~~ ~~Broadcasting~~ BROADCASTING
190		

REASON: Population growth, shifts in population, new communities and other factors are sufficient to warrant some expansion of the medium frequency broadcasting band to meet future requirements.

SUP 191

REASON: No longer required.

535-1605

BROADCASTING

REASON: There is a continuing need to provide existing and expanded broadcasting services to the general public.

kHz

Region 1	Region 2	Region 3
1605-~~2000~~ 1800	1605-~~1800~~ 1615	1605-1800
FIXED MOBILE except aeronautical mobile	~~FIXED~~ MOBILE ~~AERONAUTICAL RADIONAVIGATION~~ ~~Radiolocation~~ BROADCASTING	FIXED MOBILE
192 193 194 ~~197~~ 195A		197
	1615-1800	
	~~FIXED~~ ~~MOBILE~~ ~~AERONAUTICAL RADIONAVIGATION~~ ~~Radiolocation~~ BROADCASTING RADIOLOCATION	
195B	195B	195B

ADD 195B The bands 1615-1800 kHz and 3230-3400 kHz are also allocated to the Radiolocation service.

REASON: To accommodate radiolocation services for geophysical maritime and surveying functions.

REASON: Broadcasting added to provide expansion of medium frequency band to meet future requirements. Radiolocation modified to primary co-equal ~~shared~~ to satisfy requirements such as geophysical, maritime, and surveying functions.

ADD 195C Special agreements between administrations concerned shall determine the conditions for implementations of broadcasting in the proximity of international boundaries to preclude harmful interference being caused to the radio location service.

REASON: To ensure some measure of protection for Radiolocation systems.

kHz

Region 1	Region 2	Region 3
1800-1900 ~~FIXED~~ ~~MOBILE except aeronautical mobile~~ AMATEUR 192 193 194 ~~195~~ 195A	1800-~~2000~~ 1900 AMATEUR ~~FIXED~~ ~~MOBILE except aeronautical mobile~~ ~~RADIONAVIGATION~~ MOD 198	
1900-2000 FIXED MOBILE except aeronautical mobile Radiolocation 192 193 194 195 195A	1900-2000 AMATEUR FIXED MOBILE except aeronautical mobile RADIONAVIGATION Radiolocation MOD 198 ADD 198A	

REASON: 1800-1900: Short to medium range communications can be accomplished by the amateur service in this band, and particularly to provide an exclusive allocation worldwide.

1900-2000: To provide for geophysical, maritime, and surveying radiolocation functions, all of which are expanding and are expected to do so.

NOC 195

REASON: Requirement remains valid.

ADD 198A In Region 2 the Loran system has priority until such time as that system is discontinued by agreement between administrations. Other services to which the band is allocated may use any frequency in this band provided that they do not cause harmful interference to the Loran system until such time as that system is discontinued.

MOD 198 ~~In Region 2 the Loran system has priority. Other services to which the band is allocated may use any frequency in this band provided that they do not cause harmful interference to the Loran system.~~

In Region 3 the Loran system in any particular area operates either on 1850 or 1950 kHz, the bands occupied being 1825-1875 kHz and 1925-1975 kHz respectively. Other services to which the band 1800-2000 kHz is allocated may use any frequency therein on condition that no harmful interference is caused to the Loran system operating on 1850 or 1950 kHz.

REASON: Long range planning indicates that Loran systems will be removed from the band 1900-2000 kHz.

kHz

2000-2045 FIXED MOBILE except aeronautical mobile 193 195A	2000-2065 FIXED MOBILE
2045-2065 METEOROLICAL AIDS FIXED MOBILE except aeronautical mobile 193 195A	

REASON: Retention of this band as presently allocated is for the purpose of retaining flexibility in future sharing arrangements with fixed and mobile services.

2065-2170 FIXED MOBILE except aeronautical mobile (R) 193 195A	2065-2107 MARITIME MOBILE 200
	2107-2170 FIXED MOBILE

REASON: 2065-2107: Allocation retained to accommodate continuing need to provide services in this band in the maritime mobile service, and to meet future requirements.

2107-2170: This band is presently used for a variety of fixed and mobile services.

Retention of this band as presently allocated internationally is for the purpose of retaining flexibility in future sharing arrangements between fixed and mobile services.

NOC 200

REASON: There is a continuing need for this footnote.

kHz

Region 1	Region 2	Region 3
2170-2194	MOBILE (distress and calling) 201 201A	

REASON: There is a continuing need to maintain this band for international distress traffic and calling purposes.

NOC 201 & 201A

REASON: There is a continuing need to maintain these footnotes to provide for international distress purposes.

2194-2300 FIXED MOBILE except aeronautical mobile (R) 193 195A	2194-2300 FIXED MOBILE

REASON: This band is presently used for a variety of fixed and mobile services. Retention of this band as presently allocated is for the purpose of retaining flexibility in future sharing arrangements between fixed and mobile services.

kHz

Region 1	Region 2	Region 3
2300-2498 FIXED MOBILE except aeronautical mobile (R) BROADCASTING 202 193 195A	2300-2495 FIXED MOBILE BROADCASTING 202 2495-2505	
2498-2502 STANDARD FREQUENCY 203 203A	STANDARD FREQUENCY	
2502-2625 FIXED MOBILE except aeronautical mobile (R) 193 195A	203 203A 2505-2625 FIXED MOBILE	

REASON: 2300-2495: Same as reason stated for the band 2194-2300 kHz above. The allocation for broadcasting is being retained because of its use in tropical zones in other countries within Region 2.

2505-2625: Same as reason stated for the bands 2194-2495 kHz.

17.

kHz

Region 1	Region 2	Region 3
2625–2650	2625–2850	
MARITIME MOBILE MARITIME RADIONAVIGATION		
175 195A	FIXED MOBILE	
2650–2850		
FIXED MOBILE except aeronautical mobile (R)		
205 195A		

REASON: Same as stated for the bands 2194–2495 and 2505–2625 kHz.

2850–3025

AERONAUTICAL MOBILE (R)
201A 205A

REASON: Continued use through, and beyond, the year 2000 by the aeronautical mobile (R) service.

NOC 201A 205A

REASON: Continued need for search and rescue purposes.

18.

kHz

Region 1	Region 2	Region 3
3025–3155		
AERONAUTICAL MOBILE (OR)		

REASON: Continued use through, and beyond, the year 2000 by the aeronautical mobile (OR) service.

3155–3200

FIXED
MOBILE except aeronautical mobile (R)

REASON: This band is presently used for a variety of fixed and mobile services. Retention of this band as presently allocated is for the purpose of retaining flexibility in future sharing arrangements between fixed and mobile services.

3200–3230

FIXED
MOBILE except aeronautical mobile (R)
BROADCASTING 202

REASON: This band is presently used for a variety of fixed and mobile services; its retention is required. The allocation for the broadcasting service is being retained because of its use in the tropical zones in other countries within Region 2.

kHz

Region 1	Region 2	Region 3
3230-3400		
	FIXED MOBILE except aeronautical mobile BROADCASTING 202 ~~1928~~	
REASON: Same as stated for the band 3200-3230 kHz above.		
3400-3500		
	AERONAUTICAL MOBILE (R)	
REASON: Continued use through, and beyond, the year 2000 by the aeronautical mobile (R) service.		
3500-3800 AMATEUR ~~FIXED~~ ~~MOBILE except aeronautical mobile~~	3500-~~4000~~ 3900 AMATEUR ~~FIXED~~ ~~MOBILE except aeronautical mobile (R)~~	3500-3900 AMATEUR ~~FIXED~~ ~~MOBILE~~
3800-3900 ~~FIXED~~ ~~AERONAUTICAL MOBILE~~ (OR) ~~LAND MOBILE~~		206 207

kHz

Region 1	Region 2	Region 3
3900-3950 AERONAUTICAL MOBILE (OR)	3900-4000 AMATEUR FIXED MOBILE except aeronautical mobile (R)	3900-3950 AERONAUTICAL MOBILE BROADCASTING
3950-4000 FIXED BROADCASTING		3950-4000 FIXED BROADCASTING
REASON: To provide exclusive Region 2 amateur allocation in the band 3500-3900 kHz.		

kHz

Region 1	Region 2	Region 3
4000–4063	FIXED Mobile except aeronautical mobile (R)	
~~4063–4438~~ 4123	~~MARITIME MOBILE 208 209 209A~~ BROADCASTING FIXED	
4123–4438	MARITIME MOBILE 208 MOD 209A MOD 209	
4438–~~4650~~ 4560	~~FIXED~~ ~~MOBILE except aeronautical mobile (R)~~ MARITIME MOBILE	4438–~~4650~~ 4560 ~~FIXED~~ ~~MOBILE except aeronautical mobile~~ MARITIME MOBILE
4560–4650	FIXED MOBILE except aeronautical mobile (R)	4560–4650 FIXED MOBILE except aeronautical mobile
4650–4700	AERONAUTICAL MOBILE (R)	
4700–4750	AERONAUTICAL MOBILE (OR)	
4750–4850	4750–4850 FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE BROADCASTING 202	4750–4850 FIXED BROADCASTING 202 MOBILE except aeronautical mobile (R)

REASON: Band reduced to expand spectrum available to the maritime mobile service in the adjacent lower band, additionally the band 4063–4123 is required by high frequency broadcasting.

MOD 209A For the use of carrier frequency ~~4136.3 kHz (as from 1 January 1978 to be replaced by carrier frequency~~ 4125 kHz~~)~~ in the zone of Regions 1 and 2 south of latitude 15°N, including Mexico, and in the zone of Region 3 south of latitude 25°N, see no. 1351E.

Reason: To delete an obsolete date.

MOD 209 On condition that harmful interference is not caused to the maritime mobile service, the frequencies between ~~4063~~ 4123 and 4438 kHz may be used exceptionally by fixed stations communicating only within the boundary of the country in which they are located, with a mean power not exceeding 50 watts; however, in Regions 2 and 3, between 4238 and 4368 kHz, a mean power not exceeding 500 watts may be used by such fixed stations.

REASON: Consequential to allocation change.

kHz

Region 1	Region 2	Region 3
4850–4995	FIXED LAND MOBILE BROADCASTING 202	
Reason: Continuing need for existing allocations.		
4995–5005	STANDARD FREQUENCY 203A 210	
5005–5060	FIXED BROADCASTING ~~202~~	
5060–~~5250~~ 5200	MOBILE except aeronautical mobile (R) FIXED	
Reason: Band reduced to expand spectrum available to the maritime mobile service in the adjacent upper band.		
5200–5250	~~FIXED~~ MARITIME MOBILE	
Reason: To provide additional spectrum for use by the maritime mobile service.		
Reason: Mobile except aeronautical mobile (R) added to specific bands to accommodate national requirements.		
Reason: 202 deleted from 5005–5060 to accommodate expansion of international broadcasting.		

kHz

Region 1	Region 2	Region 3
5250–~~5430~~ 5300 ~~FIXED~~ ~~LAND MOBILE~~ MARITIME MOBILE	5250–~~5450~~ 5300 ~~FIXED~~ ~~LAND MOBILE~~ MARITIME MOBILE	5250–~~5430~~ 5300 ~~FIXED~~ ~~LAND MOBILE~~ MARITIME MOBILE
REASON: To provide additional spectrum for use by the maritime mobile service.		
5300–5430 FIXED LAND MOBILE	5300–5450 FIXED LAND MOBILE	5300–5430 FIXED LAND MOBILE
REASON: Band reduced to expand spectrum available to the maritime mobile service in the adjacent lower band.		
5430–5480 FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE	5450–5480 AERONAUTICAL MOBILE (R)	5430–5480 FIXED AERONAUTICAL MOBILE (OR) LAND MOBILE

kHz

Region 1	Region 2	Region 3
5480-5680	AERONAUTICAL MOBILE (R) 201A 205A	
5680-5730	AERONAUTICAL MOBILE (OR) 201A 205A	
5730-~~5950~~	MOBILE except aeronautical mobile (R) FIXED	
5950-6200	BROADCASTING	
6200-6525	MARITIME MOBILE 211 MOD 211A	
6525-6685	AERONAUTICAL MOBILE (R)	
6685-6765	AERONAUTICAL MOBILE (OR)	

~~MOC~~ 201A ~~MOC~~ 205A

REASON: Requirement is still valid.

~~MOD~~ 211A For the use of carrier frequency ~~6204~~ kHz (as from 1 January 1978 to be replaced by carrier frequency 6215.5 kHz) in the zone of Region 3 south of latitude 25°N, see no. 1351F.

REASON: To delete an obsolete date.

kHz

Region 1	Region 2	Region 3
6765-~~7000~~ 6950	FIXED MOBILE except aeronautical mobile (R)	

Reason: The service mobile except aeronautical mobile (R) is being added to provide for national requirements.

6950-7000	FIXED AMATEUR AMATEUR-SATELLITE	

Reason: To provide additional spectrum for use by the amateur and amateur-satellite services.

7000-7100	AMATEUR AMATEUR-SATELLITE	
7100-~~7300~~ T250	7100-~~7300~~ T250	7100-~~7300~~ T250
~~BROADCASTING~~ AMATEUR ~~212~~	AMATEUR	~~BROADCASTING~~ AMATEUR
T250-7300	T250-7300	T250-7300
BROADCASTING ~~212~~	~~AMATEUR~~ BROADCASTING	BROADCASTING

~~SUP~~ 212

REASON: Consequential to allocation change.

kHz

Region 1	Region 2	Region 3
7300-~~8195~~ 7500	FIXED BROADCASTING	
7500-7900	FIXED	
7900-8000	FIXED MOBILE except aeronautical mobile (R)	
8000-8195	FIXED MARITIME MOBILE	
8195-8815	MARITIME MOBILE 201A 213	

REASON: To eliminate difficult sharing problem between broadcasting and amateur services foregoing exclusive bands are proposed.

8815-8965	AERONAUTICAL MOBILE (R)
8965-9040	AERONAUTICAL MOBILE (OR)

kHz

Region 1	Region 2	Region 3
9040-9500	MOBILE except aeronautical mobile (R) FIXED	
9500-9775	BROADCASTING	
9775-9995	FIXED	
9995-10005	STANDARD FREQUENCY 201A 203A 214	
10005-10100	AERONAUTICAL MOBILE (R) 201A	
10100-10700	FIXED	
10700-11175	FIXED MOBILE except aeronautical mobile (R)	
11175-11275	AERONAUTICAL MOBILE (OR)	
11275-11400	AERONAUTICAL MOBILE (R)	
11400-~~11700~~ 11600	FIXED 216	

Reason: Mobile except aeronautical mobile (R) added to specific bands to accomodate national requirements.

11600-11700	FIXED BROADCASTING ~~216~~	

kHz

Region 1	Region 2	Region 3
11700-11975	BROADCASTING	
11975-~~12330~~ 12130	MOBILE except aeronautical mobile (R) FIXED	

Reason: Band reduced to expand spectrum available to the maritime mobile service.

12130-12330	~~FIXED~~ MARITIME MOBILE	

Reason: To provide additoral spectrum for use by the maritime mobile service.

12330-13200	MARITIME MOBILE 213	
13200-13260	AERONAUTICAL MOBILE (OR)	
13260-13360	AERONAUTICAL MOBILE (R)	

kHz

Region 1	Region 2	Region 3
13360-~~14000~~ 13410	~~FIXED~~ RADIO ASTRONOMY ~~217~~	

Reason: To meet the needs of Radio Astronomy by providing 50 KHz for use in the 10-13 MHz band.

13410-13700	MOBILE except aeronautical mobile (R) FIXED 217	

Reason: Band reduced to provide spectrum for use by Radio Astronomy in the adjacent lower band.

13700-13800	~~FIXED~~ ~~BROADCASTING~~	
13800-13950	FIXED	
13950-14000	~~FIXED~~ AMATEUR 217	

Reason: To provide additional spectrum for use by the amateur and broadcasting services.

14000-14250	AMATEUR AMATEUR-SATELLITE	
14250-14350	AMATEUR 218	
14350-~~14990~~ 14400	~~FIXED~~ AMATEUR	

kHz

Region 1	Region 2	Region 3
14400-14600	FIXED	
14600-14990	MOBILE except aeronautical mobile (R) FIXED	

Reason: The service MOBILE except aeronautical mobile (R) in the preceding bands is being added where indicated to provide for national requirements.

NOC 217 Reason: Continuing need for IBM frequency.

kHz

Region 1	Region 2	Region 3
14990-15010	STANDARD FREQUENCY 201A 203A 219	
15010-15100	AERONAUTICAL MOBILE (OR)	
15100-15450	BROADCASTING	
15450-15550	BROADCASTING FIXED	
15550-16460 15950	FIXED	

Reason: Band reduced to expand spectrum available to the maritime mobile service. Broadcasting added to provide expansion of service.

15950-16310	FIXED MOBILE except aeronautical mobile (R)	
16310-16460	FIXED MARITIME MOBILE	

Reason: To provide additional spectrum for use by the maritime mobile service.

16460-17360	MARITIME MOBILE 213	
17360-17900 17410	FIXED MARITIME MOBILE	
17410-17900	FIXED	

Reason: Band reduced to provide additional spectrum for use by the maritime mobile service in the adjacent lower band.

kHz		
Region 1	Region 2	Region 3
~~17600~~-17700	~~BROADCASTING~~ ~~FIXED~~	
17700-17900	BROADCASTING	
17900-17970	AERONAUTICAL MOBILE (R)	
17970-18030	AERONAUTICAL MOBILE (OR)	
18030-18052	FIXED	
18052-18068	FIXED Space Research	
18068-~~19990~~ 19000	FIXED	
19000-19500	FIXED MOBILE except aeronautical mobile (R)	

kHz		
Region 1	Region 2	Region 3
19500-19990	FIXED	
19990-20010	STANDARD FREQUENCY 201A 203A 220	
20010-~~21000~~ 20230	~~FIXED~~ MARITIME MOBILE	
20230-20400	FIXED	
20400-20700	FIXED MOBILE except aeronautical mobile (R)	
20700-20950	FIXED	
20950-21000	~~FIXED~~ AMATEUR AMATEUR-SATELLITE	
21000-21450	AMATEUR AMATEUR-SATELLITE	

REASON: Fixed band reduced to provide additional spectrum for use by the amateur, amateur satellite, and maritime mobile services.

kHz

Region 1	Region 2	Region 3
21450-21750	BROADCASTING	
21750-21850	FIXED MOBILE except aeronautical mobile (R)	
21850-21870	~~RADIO ASTRONOMY~~ AERONAUTICAL MOBILE (R) 221 B	
Reason: Band for radio astronomy moved to higher in the spectrum. (See 25600-25760 kHz)		
21870-22000	~~AERONAUTICAL FIXED~~ AERONAUTICAL MOBILE (R)	
Reason: To provide additional spectrum for the aeronautical mobile (R) service.		

kHz

Region 1	Region 2	Region 3
22000-22720	MARITIME MOBILE	
22720-~~23000~~ 22855	~~FIXED~~ MARITIME MOBILE	
Reason: To provide addtional spectrum for use by the maritime mobile service.		
22855-~~23000~~ 23000	FIXED	
Reason: Band reduced to provide additional spectrum for the maritime mobile service in the adjacent lower band.		
23000-23200	FIXED MOBILE except aeronautical mobile (R)	
23200-23350	AERONAUTICAL FIXED AERONAUTICAL MOBILE (OR)	
23350-24990	MOBILE except aeronautical mobile (R) FIXED LAND MOBILE 222 227A	
24990-25010	STANDARD FREQUENCY 203A 223	
25010-25070	FIXED MOBILE except aeronautical mobile	
25070-25110	MARITIME MOBILE 224	

37.

kHz		
Region 1	Region 2	Region 3
25110-25600	FIXED MOBILE except aeronautical mobile	
25600-~~26100~~ 25760	~~BROADCASTING~~ RADIO ASTRONOMY	
25760-25860	~~BROADCASTING~~ AMATEUR	

REASON: Band reduced to provide spectrum for the radio astronomy service.

38.

kHz		
Region 1	Region 2	Region 3
25860-26100	BROADCASTING	
26100-27500	FIXED MOBILE except aeronautical mobile 225 MOD 226	

NOC 225 Reason: Continued need for ISM frequency.

MOD 226 In ~~Region~~ 2, Australia and New Zealand, the amateur service may operate between the frequencies 26960 and 27230 kHz.

MHz

Region 1	Region 2	Region 3
27.5-28 METEOROLOGICAL AIDS MOBILE 227	27.5-28 METEOROLOGICAL AIDS FIXED MOBILE	
28-29.7	AMATEUR AMATEUR-SATELLITE	
29.7-30.005	FIXED 228 229 231 232 MOBILE	
30.005-30.01	SPACE OPERATION (Satellite identification) FIXED 228 229 231 MOBILE SPACE RESEARCH	

Reason: Operational requirements remain constant and the need exists to confine operations to specific services and avoid interference from non-allocated services.

30.01-37.75	FIXED 228 229 230 231 MOBILE Radio Astronomy 233A MOD 233B	

MOD 233B In making assignments to stations of other services to which the bands 37.75 37.5 - 38.25 38.0 MHz, 150.05 - 153 MHz, 406.1 - 410 MHz, 2690 2670 - 2700 MHz and 4700-4950 4990-MHz are allocated, administrations are urged to take all practicable steps to protect radio astronomy observations from harmful interference.

Reason: To make provision for radio astronomy in the band 37.5 - 37.75 MHz, and 2670-2700 MHz bands.

Reason: Mobile added 27.5-28 MHz to provide worldwide allocation for mobile services.

MHz

Region 1	Region 2	Region 3
37.75-38.25 38.00	FIXED 228 229 231 MOBILE Radio Astronomy MOD 233B	
38.00-38.25	FIXED 228 229 231 MOBILE Radio Astronomy RADIO ASTRONOMY 233B	

Reason: To provide for primary allocation to radio astronomy.

38.25-41	FIXED 228 229 230 231 MOBILE 235 236 236A	
41-47 BROADCASTING Fixed 228 237 Mobile 236A 238 239 240 241	41-50 FIXED 228 231 237 MOBILE 233A 236A	41-44 FIXED 228 237 MOBILE 236A 44-50 FIXED 228 231 237 BROADCASTING MOBILE

Reason: Delete 237 in Regions 2 and 3 since not applicable.

MOC 236 Reason: Continuing need for ISM frequency.

41.

MHz		
Region 1	Region 2	Region 3
47-68		
	50-54	
		AMATEUR 244 245 246 247
BROADCASTING 238 239 241 242 243	54-68 FIXED 228 237 MOBILE BROADCASTING	54-68 FIXED 228 231 237 MOBILE BROADCASTING 246

Reason: Operational requirements remain constant.

42.

MHz		
Region 1	Region 2	Region 3
68-~~74.8~~ 73.0 FIXED MOBILE except aeronautical mobile 248 249 250 251 252	68-73 FIXED MOBILE BROADCASTING	68-70 FIXED MOBILE AERONAUTICAL RADIONAVIGATION 254 255 256
		70-~~74.6~~ 73.0 FIXED MOBILE 256 257 258
73.00-74.60 FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY ~~248~~ 249 250 251 252	73-74.6 RADIO ASTRONOMY MOD 253A 253B	73.0-74.6 FIXED MOBILE RADIO ASTRONOMY 256 257 258

MOD 253A In region 2, fixed, mobile and broadcasting service operations previously authorized in the band 73-74.6 MHz may continue to operate on a non-interference basis to the radio astronomy service until 12/31/85.

Reason: To make provisions for the use of the band 73.00-74.6 MHz by radio astronomy.

MHz

Region 1	Region 2	Region 3
74.6–74.8 ~~FIXED~~ ~~MOBILE except aeronautical mobile~~ AERONAUTICAL RADIONAVIGATION ~~248 249 250~~ 251 252	74.6–75.4	AERONAUTICAL RADIONAVIGATION
74.8–75.2 AERONAUTICAL RADIONAVIGATION MOD 259		
75.2–~~87.5~~ 75.4 AERONAUTICAL RADIONAVIGATION ~~FIXED~~ ~~MOBILE except aeronautical mobile~~ ~~248 250~~ 252 ~~260 261 262 263~~		MOD 259

Reason: To align region 1 with regions 2 and 3 in providing common worldwide band for aeronautical marker beacons.

MOD 259 The frequency 75 MHz is assigned to aeronautical marker beacons. Administrations shall refrain from assigning frequencies close to the limits of the guardband to stations of other services which, because of their power or geographical position, might cause harmful interference or otherwise place a constraint on to marker beacons.

Reason: To further protect the marker beacon frequency.

MHz

Region 1	Region 2	Region 3
75.4–87.5 FIXED MOBILE except aeronautical mobile 248 250 252 260 261 262 263	75.4–88 FIXED MOBILE BROADCASTING	75.4–78 FIXED MOBILE 255 256 257 266
		78–80 FIXED MOBILE AERONAUTICAL RADIONAVIGATION 255 256 257 261 266
		80–87 FIXED MOBILE 254 255 256 257 261 266
87.5–100 BROADCASTING 264 265	88–100 BROADCASTING	87–100 FIXED MOBILE BROADCASTING 254 267 268

Reason: Requirements remain unchanged.

MHz

Region 1	* *	Region 2	* *	Region 3
100-108 MOBILE except aeronautical mobile (R) 269 270 271		100-108 BROADCASTING 255 256 258 267 272		

Reason: Requirement remains same.

108-117.975	AERONAUTICAL RADIONAVIGATION
117.975 - 132	AERONAUTICAL MOBILE (R) 201A 273 MOD 273A 273B
132-136	AERONAUTICAL MOBILE (R) MOD 273A 273B 274 ~~274A~~ 274B 275

MOD 273A In the band 117.975-132 MHz ~~and in the band 132-136 MHz~~, ~~where the aeronautical mobile (R) service is authorized, the use and development for this service of~~ space communications techniques may be authorized for the aeronautical mobile (R) service ~~but limited initially to satellite relay stations of the aeronautical mobile (R) service~~. Such use and ~~development~~ shall be subject to coordination between administrations concerned and those having services operating in accordance with the Table, which may be affected.

Reason: To provide for full satellite application in the band 117.975-136 MHz as a logical extension of the existing terrestrial service.

ADD 273B In the band 117.975-136 MHz, the use of airborne electronic aids to air navigation and any directly associated ground based or satellite borne facilities also may be authorized. Such use shall be subject to coordination between administrations concerned and those having services operating in accordance with the Table, which may be affected.

Reason: To provide flexibility required for position determination through the use of satellites.

SUP 274A

Reason: The date of applicability has passed.

MHz

Region 1	Region 2	Region 3
136-137	SPACE RESEARCH (Space-to-Earth) 281A 281AA	
137-138	SPACE OPERATION (Telemetering and tracking) METEOROLOGICAL-SATELLITE SPACE RESEARCH (Space-to-Earth) 275A 279A 281C 281E	
138-143.6 AERONAUTICAL MOBILE (OR) 275 281G 282A 283	138-143.6 FIXED MOBILE Radiolocation Space Research (Space-to-Earth) 283A	138-143.6 FIXED MOBILE Space Research (Space-to-Earth) 278 279A 284

MHz

Region 1	Region 2	Region 3
143.6–143.65 AERONAUTICAL MOBILE (OR) SPACE RESEARCH (Space-to-earth) 275 283	143.6–143.65 FIXED MOBILE Radiolocation Space Research (Space-to-Earth) 283A	143.6–143.65 FIXED Space Research (Space-to-Earth) MOBILE 278 279A 284
143.65–144 AERONAUTICAL MOBILE (OR) 275 283 282A	143.65–144 FIXED MOBILE Radiolocation Space Research (Space-to-Earth)	143.65–144 FIXED MOBILE Space Research (Space-to-Earth) 278 279A 284
144–146 AMATEUR AMATEUR-SATELLITE		
146–149.9 FIXED MOBILE except aeronautical mobile (R) 285 285A	146–148 AMATEUR 289	
	148–149.9 FIXED MOBILE 285A 290	

MHz

Region 1	Region 2	Region 3
149.9–150.05 RADIONAVIGATION-SATELLITE 285B 285C		
150.05–151 FIXED MOBILE except aeronautical mobile (R) RADIO ASTRONOMY MOD 233B 285 286A	150.05–174 FIXED MOBILE	150.05–170 FIXED MOBILE
151–153 FIXED MOBILE except aeronautical mobile (R) RADIO ASTRONOMY Meteorological Aids MOD 233B 285 286A		
153–154 FIXED MOBILE except aeronautical mobile (R) Meteorological Aids 285		
154–156 FIXED MOBILE except aeronautical mobile (R) 285		

49.

MHz

Region 1	Region 2	Region 3
156-174		201A 287 290
		170-174
FIXED MOBILE except aeronautical mobile		FIXED MOBILE BROADCASTING
201A 285 287 288	201A 233A 287	

MOC 287 Reason: Existing provisions must be continued.

50.

MHz

Region 1	Region 2	Region 3
174-216	174-216	
BROADCASTING		FIXED MOBILE BROADCASTING
291 292 293 294		294 295 296
216-223	216-220	216-225
AERONAUTICAL RADIONAVIGATION BROADCASTING	FIXED MOBILE RADIOLOCATION	AERONAUTICAL RADIONAVIGATION Radiolocation
	220-225	
	AMATEUR	
	RADIOLOCATION MOBILE	
297 298 299 300 301		306 307 308

SUP 294 To enhance sharing.

REASON: To provide for possible mobile use of band.

MHz

Region 1	Region 2	Region 3
223-235 AERONAUTICAL RADIONAVIGATION Fixed Mobile 299 300 301 302 303 304 305	225-235 FIXED MOBILE	225-235 FIXED MOBILE AERONAUTICAL RADIONAVIGATION

Reason: Requirements remain unchanged.

235-267	FIXED MOBILE 301A 305 305A 308A 309

REASON: Requirements remain unchanged.

267-272	FIXED MOBILE Space Operations 309A 309B (telemetering) 308A

MHz

Region 1	Region 2	Region 3
272-273	FIXED MOBILE SPACE OPERATIONS 309A (telemetering) 308A	
273-328.6	FIXED MOBILE 308A 310 310A	

Reason: Requirements remain unchanged.

328.6-335.4	AERONAUTICAL RADIONAVIGATION 311

REASON: Necessary for continuing and expanding needs of service.

335.4-399.9	FIXED MOBILE 308A

REASON: Requirements remain unchanged.

399.9-400.05	RADIONAVIGATION-SATELLITE 285C 311A
400.05-400.15	STANDARD FREQUENCY-SATELLITE 312B 313 314

53.

MHz

Region 1	Region 2	Region 3
400.15–401	METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (Maintenance telemetering) SPACE RESEARCH (Telemetering and tracking) 313 314	
401–402	METEOROLOGICAL AIDS SPACE OPERATION (Telemetering) 315A Fixed Meteorological-Satellite (Earth-to-Space) Mobile except aeronautical mobile 314 315 315B 315C 316	
402–403	METEOROLOGICAL AIDS Fixed Meteorological-Satellite (Earth-to-space) Mobile except aeronautical mobile 314 315 315C 316	
403–406	METEOROLOGICAL AIDS Fixed Mobile except aeronautical mobile 314 315 316	
406–406.1	MOBILE-SATELLITE (Earth-to-space) 314 317A 317B	

Reason: Services required as existing now.

54.

MHz

Region 1	Region 2	Region 3
406.1–410	FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY MOD 233B 314	
410–420	FIXED MOBILE except aeronautical mobile 314	

Reason: Requirements remain unchanged.

420–430 FIXED MOBILE except aeronautical mobile Radiolocation 318 319		420–~~450~~ 435 RADIOLOCATION Amateur 318 ~~319A~~ 319B ~~320A~~ 323 324
~~430–440~~ 435 AMATEUR RADIOLOCATION 318 319 319B 320 ~~320A~~ 321 322		

MHz

Region 1	Region 2	Region 3
435–438	435–438	
AMATEUR RADIOLOCATION	Amateur RADIOLOCATION	
Amateur-Satellite	Amateur Satellite	
318 319 ~~319B~~ 320 ~~320A~~ ~~321~~ ~~322~~	318 ~~319A~~ ~~319B~~ ~~320A~~ 323 324	

MOC 318 Reason: Requirement remains unchanged.

SUP 320A Reason: Consequential to allocation proposal.

MHz

Region 1	Region 2	Region 3
438–440	438–450	
RADIOLOCATION AMATEUR		RADIOLOCATION Amateur
318 319 ~~319B~~ 320 ~~320A~~ ~~321~~ 322		
440–450		
FIXED MOBILE except aeronautical mobile Radiolocation		
318 319 319A		318 319A 319B 320A 323 324

Reason: The allocation change in the band 435 MHz–438 MHz is required to accommodate greater flexibility in amateur satellite experimentation. Footnote suppression and other reallocations are consequential to this allocation.

450–460	FIXED MOBILE 318B 318C 318 319A	
460–470	FIXED MOBILE 318B 318 C Meteorological-Satellite (Space-to-Earth) 318A 324B	

MOC 318B, 318C
Reason: Continuing requirement

MHz

Region 1	Region 2	Region 3
470-582 BROADCASTING	470-890 512 BROADCASTING MOBILE 320A 332 332A	470-585 BROADCASTING 335
	512-608 BROADCASTING 329A 332 332A	
582-606 BROADCASTING RADIONAVIGATION 325 327 328 329		585-610 RADIONAVIGATION 330B 336 337
606-790 BROADCASTING 329 330 330A 331 MOD 332 332A	608-614 BROADCASTING RADIO ASTRONOMY 320A 332 332A	610-890 FIXED MOBILE BROADCASTING
	614-806 BROADCASTING 320A 332 332A	
790-890 FIXED BROADCASTING 329 331 333 334	806-890 Broadcasting ~~BROADCASTING~~ MOBILE 320A 332 332A 329B 329C	330B MOD 332 332A 338 339

REASON: See paragraphs 56 through 63 in the narrative portion. Footnote suppressions are consequential to allocation proposals.

ADD 329B In Region 2, the band 806-890 MHz is also allocated to the mobile-satellite service for the use and development of systems using space radiocommunications techniques. Such use and development is subject to agreement and coordination between the administrations concerned and those having services, operating in accordance with the table, which may be affected.

REASON: To provide spectrum allocation for possible development and use of a mobile satellite system for public services.

ADD 329C Special agreements between administrations concerned shall determine the conditions for implementations of broadcasting in the proximity of international boundaries to preclude harmful interference being caused to the mobile service.

REASON: To provide some protection to the mobile service operating in this band.

MOD 332 In Region 1, except the African Broadcasting Area*, the band 606-614 MHz and in Region 3, the band 610-614 MHz may be used by the radio astronomy service. Administrations shall avoid using the band concerned for the broadcasting service as long as possible, and thereafter, as far as practicable, shall avoid the use of such effective radiated powers as will cause harmful interference to radio astronomy observations.

~~In Region 2, the band 608-614 MHz is reserved exclusively for the radio astronomy service until the first Administrative Radio Conference after 1 January, 1974 which is competent to review this provision; however, this provision does not apply to Cuba.~~

REASON: Consequential to allocation proposals.

MHz

Region 1	Region 2	Region 3
890-942 896 FIXED BROADCASTING Radiolocation 329 331 333 339A	890-942 896 FIXED RADIOLOCATION MOBILE 339A 340	890-942 896 MOBILE FIXED BROADCASTING Radiolocation 339 339A
896-902 FIXED BROADCASTING Radiolocation MOBILE 329 331 333 339A	896-902 FIXED RADIOLOCATION MOBILE Radiolocation 339A 340	896-902 FIXED MOBILE BROADCASTING Radiolocation 339 339A
902-928 FIXED Radiolocation BROADCASTING 329 331 333 339A MOD 340	902-928 FIXED RADIOLOCATION Amateur Mobile 339A MOD 340	902-928 FIXED MOBILE BROADCASTING Radiolocation 339 339A MOD 340
928-941 FIXED Radiolocation BROADCASTING 329 331 333 339A	928-941 FIXED RADIOLOCATION MOBILE 339A	928-941 MOBILE FIXED Radiolocation BROADCASTING 339 339A

Reason: This allocation is required to meet the expanded needs of the Land Mobile Service.

Reason: This allocation is required to meet the expanding needs of the Mobile Service and to provide for experimentation by the Amateur Radio Service.

Reason: This allocation is required to meet the expanding needs of the Land Mobile Radio Service. Footnote suppression and addition are consequential to this change.

MOD 340 In Region 2, The frequency 915 MHZ is designated for industrial, scientific and medical purposes. Emissions must be confined within the limits of ±13 MHz of that frequency. Radiocommunication services operating within these limits must accept any harmful interference that may be experienced from the operation of industrial, scientific and medical equipment.

Reason: To provide for ISM frequency worldwide.

MHz

Region 1	Region 2	Region 3
941-942 FIXED BROADCASTING Radiolocation MOBILE 329 331 333 339A	941-942 FIXED RADIOLOCATION MOBILE Radiolocation 339A 340	941-942 FIXED BROADCASTING Radiolocation MOBILE 339 339A
942-947 FIXED BROADCASTING MOBILE 329 331 333 339A	942-947 FIXED MOBILE 339A	942-947 MOBILE FIXED BROADCASTING 338 339 339A

REASON: This allocation is required to meet the expanding needs of the Mobile Radio Services. The bands 896-902 MHz and 941-947 MHz may be used for an air-ground Common Carrier service.

Region 1	Region 2	Region 3
947-952 FIXED BROADCASTING 329 331 333 339A	947-952 FIXED 339A	947-952 FIXED BROADCASTING MOBILE 338 339 339A

REASON: This allocation is required to provide exclusive allocation to the Fixed Service.

61.

MHz		
Region 1	Region 2	Region 3
952-960 FIXED BROADCASTING 329 331 333 339A	952-960 FIXED MOBILE 339A	952-960 FIXED MOBILE BROADCASTING 338 339 339A

Reason: This allocation is required to provide for expanding needs of the Mobile Radio Service.

960-1215	AERONAUTICAL RADIONAVIGATION 341

Reason: Continuing requirement.

62.

MHz		
Region 1	Region 2	Region 3
1215-1300 1240	RADIONAVIGATION SATELLITE (Space-to-Earth) RADIOLOCATION ~~Amateur~~ 342 343 344 345 346A	
1240-~~1300~~ 1290	RADIOLOCATION Amateur 342 343 344 345 346A	
1290-1300	RADIOLOCATION Amateur Amateur Satellite 342 343 344 345 346A	
1300-1350	AERONAUTICAL RADIONAVIGATION MOD 346 Radiolocation 347 348 MOD 349A 349B	

Reason: Spectrum in the 1290-1300 band can be shared on a secondary basis for amateur satellite research. Band 1215-1350 needed for continued and expanding use of radiolocation and aeronautical radionavigation services.

1350-1400 1370 FIXED MOBILE RADIOLOCATION 349 MOD 349A 349B	1350-1400 1370 RADIOLOCATION 349 MOD 349A 349B

ADD 346A In the bands 1215-1300 MHz, 3100-3300 MHz, 5250-5350 MHz and 9500-9800 MHz radiolocation operations using space techniques may be conducted in support of Space Research and Earth Exploration Satellite services provided that harmful interference is not caused to terrestrial Radiolocation and Aeronautical Navigation services or the Radionavigation Satellite service in the band 1215-1240 MHz.

Reason: This is the low-band required for multifrequency radars required for the measurement of rain, drop size, rain cloud echo and melting-layer height mapping. Also required for imaging radars of a future mission. The proposal is considered compatible with existing usage.

MOD 346 The use of the bands 1300-1350 MHz, 2700-2900 MHz and 9000-9200 MHz by the aeronautical radionavigation service is restricted to ground-based radars and, in the future, to associated transponders which transmit only on frequencies in these bands and only when actuated by radars operating in the same band.

ADD 349B In the band 1300-1400 MHz, Earth Exploration Satellite (EES) passive sensors may be used. Administrations are urged to bear in mind the needs of the EES Service in this band.

Reason: Preceding notes reflect national requirements.

MHz

Region 1	Region 2	Region 3
1370-1400 FIXED MOBILE RADIOLOCATION 349 MOD 349A 349B	1370-1400 RADIOLOCATION 349 MOD 349A 349B	

MOD 349A: Radio astronomy observations on the Hydrogen line displaced towards lower frequencies are carried out in a number of countries under national arrangements. Administrations should bear in mind the needs of the radio astronomy service in their future planning of the band 1350 1330-1400 MHz.

Reason: Use of the 1330-1400 MHz band for radio astronomy will permit observation of the hydrogen line considered to be of major astronomical significance. The bands above otherwise are needed for the continued use and expansion of fixed mobile and radiolocation services.

1400-1427	EARTH EXPLORATION SATELLITE (Passive) SPACE RESEARCH (Passive) RADIO ASTRONOMY

Reason: This is an important band for the hydrogen line and for continum observations.

1427-1429	SPACE OPERATION (Telecommand) FIXED MOBILE except aeronautical mobile

MHz

Region 1	Region 2	Region 3
1429-1525 FIXED MOBILE except aeronautical mobile	1429-1435 FIXED MOBILE	1429-1525 FIXED MOBILE
	1435-1525 MOBILE 349C Fixed	

ADD 349C: In Region 2 where the mobile service is authorized in the bands 1435-1535 MHz and 2310-2390 MHz the primary use of this allocation is by the aeronautical mobile service for telemetering purposes.

Reason: The change is required to provide for aeronautical telemetering. The bands are otherwise required for continued use and expansion of the fixed and mobile services.

MHz

Region 1	Region 2	Region 3
1525-1535 SPACE OPERATION (Telemetering) 350A FIXED 350B Earth Exploration-Satellite Mobile except aeronautical mobile 350C	1525-1535 SPACE OPERATION (Telemetering) 350A Earth Exploration-Satellite Mobile 350D 349C Fixed	1525-1535 SPACE OPERATION (Telemetering) 350A FIXED 350B Earth Exploration-Satellite Mobile
1535-1542.5 MARITIME MOBILE-SATELLITE 352 352D 352E		

Reason: Band is required for continuing need of maritime mobile satellite service.

MHz

Region 1	Region 2	Region 3
1542.5-1543.5	AERONAUTICAL MOBILE SATELLITE (R) MARITIME MOBILE SATELLITE 352 352D 352F ADD 352L	
1543.5- 1558.5	AERONAUTICAL MOBILE SATELLITE (R) 352 352D 352G	
1558.5-~~1636.5~~ 1595	RADIONAVIGATION SATELLITE AERONAUTICAL RADIONAVIGATION 352 ~~352~~A 352B 352D	
1595-1636.5	AERONAUTICAL RADIONAVIGATION AERONAUTICAL RADIONAVIGATION SATELLITE 352 ~~352~~A 352B 352D MOD352K	

MOD 352K Radio astronomy observations on important spectral lines due to the hydroxyl radicle OH at frequencies 1612.231 MHz and 1720.530 MHz are carried out in a number of countries under national arrangements; the bands observed being 1611.5-1612.5 1610.5-1614 MHz and 1720-1721 MHz respectively. Administrations should bear in mind the needs of radio astronomy service in their future planning of the bands 1558.5-1636.5 MHz and 1710-1770 MHz.

In making assignments in the band 1595 -1636.5 MHz and 1720-1721 administrations are urged to prevent harmful interference to radio astronomy observations, particularly from airborne or spaceborne transmitters.

Reason: Protection of observation of important spectral line.

ADD 352L In the frequency bands 1542.5-1543.5 MHz and 1644-1645 MHz distress and safety operations of the Maritime Mobile Satellite and the Aeronautical Mobile Satellite Services shall be given priority.

MOD 352A The bands ~~1558.5-1636.5 MHz, 4200-4400 MHz~~, 5000-5250 MHz ~~and 15.4-15.7 GHz~~ are is reserved on a world-wide basis for the use and development of airborne electronic aids to air navigation and any directly associated ground-based or satellite-borne facilities.

MHz

Region 1	Region 2	Region 3
1636.5-1644	MARITIME MOBILE-SATELLITE 352 352D 352H	
1644-1645	AERONAUTICAL MOBILE SATELLITE (R) MARITIME MOBILE-SATELLITE 352 352D 352I 352L	
1645-1660	AERONAUTICAL MOBILE-SATELLITE (R) 352 352D 352J	

MHz

Region 1	Region 2	Region 3
1660-1670		
	RADIO ASTRONOMY METEOROLOGICAL AIDS	
	MOD 353A 354 354A 354B	
MOD 353A In view of the successful detection by astronomers of two hydroxl spectral lines in the regions of 1665 MHz and 1667 MHz administrations are urged to give all practicable protection in the band 1660-1670 MHz for future research in radio astronomy particularly by eliminate air-to-ground transmissions in the meteorological aids service in the band 1664.4-1668.4 MHz as soon as practicable. Until such operations are phased out, radiosonde operations will, where possible, be notified to the radio astronomers.		
1670-1690		
	METEOROLOGICAL AIDS FIXED METEOROLOGICAL-SATELLITE (Space-to-Earth) 324A MOBILE except aeronautical mobile	
	354	

MHz

Region 1	Region 2	Region 3
1690 - 1700 METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (Space-to-Earth) Fixed Mobile except aeronautical mobile 324B 354A	1690 - 1700 METEOROLOGICAL AIDS METEOROLOGICAL-SATELLITE (Space-to-Earth) 324B 354A 354C	
1700 - 1710 FIXED SPACE RESEARCH (Space-to-Earth) Mobile METEOROLOGICAL SATELLITE (Space-to-Earth) 354B	1700 - 1710 FIXED MOBILE METEOROLOGICAL SATELLITE (Space-to-Earth) SPACE RESEARCH (Space-to-Earth) 354B	

REASON: Required worldwide for meteorological satellites.

1710 - ~~1770~~ 1720 FIXED Mobile MARITIME MOBILE-SATELLITE 356B (Space-to-Earth) ~~356A~~ 356	1710 - ~~1770~~ 1720 FIXED MOBILE MARITIME MOBILE-SATELLITE 356B (Space-to-Earth) 352K 356A	

REASON: To provide for anticipated heavy demand for maritime satellite services. PFD limit to be established.

MHz

Region 1	Region 2	Region 3
MOD 356A: In Region 2, in Australia and Japan the band ~~1750~~ 1770 - 1850 MHz may also be used for earth-to-space transmissions and in Regions 2 and 3, the band 2200 - 2290 MHz may also be used for space-to-earth transmissions in the space research service, subject to agreement between the administrations concerned and those having services operating in accordance with the table, which may be affected.		
REASON: Consequential to allocation change.		
ADD 356B: The use of the band 1710-1720 MHz and 1970-1990 MHz in the Maritime Mobile-Satellite service is for communications and/or radio determination purposes.		
REASON: To provide for multiservice functions.		
1720 - 1721 FIXED Mobile ~~352K~~ 356 MOD 352K	1720 - 1721 FIXED MOBILE ~~352K~~ 356A MOD 352K	
1721 - 1770 FIXED SPACE OPERATIONS (Earth-to-Space) Mobile ~~352K~~ 356	1721 - 1770 FIXED SPACE OPERATIONS (Earth-to-Space) MOBILE ~~352K~~ 356A	

MHz

Region 1	Region 2	Region 3
1770 - 1790 ~~FIXED~~ SPACE OPERATIONS (Earth-to-Space) Meteorological-Satellite 356AA Mobile 356	1770 - 1790 FIXED SPACE OPERATIONS (Earth-to-Space) MOBILE Meteorological-Satellite 356AA MOD 356A	
1790 - ~~2290~~ 1850 FIXED SPACE OPERATION (Earth-to-Space) Mobile 356 ~~356AB~~ 356ABA ~~356AC~~	1790 - ~~2290~~ 1850 FIXED SPACE OPERATION (Earth-to-Space) MOBILE MOD 356A ~~356AB~~ ~~356ABA~~	
1850-1970 FIXED Mobile 356 356AB 356ABA 356AC	1850-1970 FIXED MOBILE 356A 356AB 356ABA	
Reason: To support U.S. requirements for telemetry, tracking and control of satellites.		

MHz

Region 1	Region 2	Region 3
1970-1990 FIXED Mobile MARITIME MOBILE-SATELLITE (Earth-to-Space) 356B 356 ~~356AB 356ABA~~ ~~356AC~~	1970-1990 FIXED MOBILE MARITIME MOBILE-SATELLITE (Earth-to-Space) 356B ~~356A 356AB 356ABA~~	
1990-2025 FIXED Mobile ~~356~~ ~~356AB 356ABA~~ ~~356AC~~	1990-2025 FIXED MOBILE ~~356A 356AB 356ABA~~	

REASON: To provide pairing frequencies to 1710-1720 MHz.

MHz

Region 1	Region 2	Region 3
2025-2110 FIXED EARTH EXPLORATION SATELLITE (Earth-to-space) SPACE RESEARCH (Earth-to-space) Mobile 356 ~~356AB 356AC 356ABA~~	2025-2110 FIXED MOBILE EARTH EXPLORATION SATELLITE (Earth-to-space) SPACE RESEARCH (Earth-to-space) ~~356A 356AB 356ABA~~	
2110-2120 FIXED Mobile SPACE RESEARCH (Earth-to-space)(Deep space only) 356 MOD 356AB ~~356ABA 356AC~~	2110-2120 FIXED MOBILE SPACE RESEARCH (Earth-to-space) (Deep space only) ~~356ABA 356A~~ MOD 356AB	

MOD 356AB In Regions 2 and 3 and in Spain, in the band 2025 2110-2120 MHz Earth-to-space transmissions in the earth exploration-satellite service may be authorized with equality of right to operate with stations of other space radiocommunication services in this band and subject to agreement between the administrations concerned and those having services, operating in accordance with the Table, which may be affected.

2120-2200 FIXED Mobile 356 ~~356AB 356ABA~~ ~~356AC~~	2120-2200 FIXED MOBILE ~~356A 356AB 356ABA~~	
2200-2290 FIXED Mobile SPACE RESEARCH (Space-to-Earth) (Space-to-Space) SPACE OPERATIONS (Space-to-Earth) (Space-to-Space) 356 ~~356AB- 356ABA~~	2200-2290 FIXED MOBILE SPACE RESEARCH (Space-to-Earth) (Space-to-Space) SPACE OPERATIONS (Space-to-Earth) (Space-to-Space) MOD 356A ~~356AB- 356ABA~~	

Reason: Previous band changes are requirements of the U.S.

75.

MHz

Region 1	Region 2	Region 3
2290-2300 FIXED SPACE RESEARCH (Space-to-Earth) (Deep space only) Mobile except aeronautical mobile 356C	2290-2300 FIXED MOBILE except aeronautical mobile SPACE RESEARCH (Space-to-Earth) (Deep space only)	

Reason: Continued use of the band for fixed and mobile services and requirements for space research.

	2300-~~2450~~ 2310 RADIOLOCATION Amateur Fixed Mobile ~~357~~ 360	

76.

MHz

Region 1	Region 2	Region 3
2300-~~2450~~ 2390 FIXED Amateur Mobile Radiolocation ~~357~~ 358 359	2310-~~2450~~ 2390 RADIOLOCATION ~~Amateur~~ Fixed ~~Mobile~~ MOBILE ~~357~~ 349C 360	
2390-2400 FIXED Amateur Mobile Radiolocation Amateur-Satellite ~~357~~ 358 359	2390-2400 RADIOLOCATION Amateur Fixed Mobile Amateur-Satellite ~~357~~ 360	
2400-2450 FIXED Amateur Mobile Radiolocation 357 358 359 357A	2400-2450 RADIOLOCATION Amateur Fixed Mobile 357 360 357A	

ADD 357A The frequencies 2450 MHz and 5800 MHz are designated for the wireless transmission of power. Emissions must be confined within ±10 MHz of the frequencies designated. This electrical energy transfer may be effected from space-to-earth. Use of the frequencies for wireless transmission of power shall not cause harmful interference to stations in other bands which are operating in accordance with these regulations.

REASON: Bands are needed for continued use of fixed, mobile, amateur and radiolocation services. Amateur satellite operation on a world wide basis is feasible in the 2390-2400 MHz band on a secondary basis.

NOC 357 Continuing need for ISM frequencies.

77.

MHz

Region 1	Region 2	Region 3
2450-2500 FIXED MOBILE Radiolocation Land Mobile-Satellite 357 361 357A	2450-2500 FIXED MOBILE Land Mobile-Satellite RADIOLOCATION 357 357A	

Reason: Expanding needs for land mobile satellite service requires spectrum space. In addition there is continuing demand for fixed and mobile services and radiolocation requirements.

78.

MHz

Region 1	Region 2	Region 3
2500 - 2550 FIXED 364C MOBILE except aeronautical mobile BROADCASTING-SATELLITE 361B 361A 362 364F	2500 - 2535 FIXED 364C FIXED-SATELLITE (Space-to-Earth) MOBILE except aeronautical mobile BROADCASTING-SATELLITE 361B 361A 364E 364F	
	2535 - 2550 FIXED 364C MOBILE except aeronautical mobile BROADCASTING-SATELLITE 361B 361A 364F	
2550 - 2655 FIXED 364C MOBILE except aeronautical mobile BROADCASTING-SATELLITE 361B 362 363 364 364F		

REASON: Continued and expanding use of fixed service systems, radiolocation facilities, mobile operations and satellite systems, with heavy demands on available spectrum.

MHz

Region 1	Region 2	Region 3
2655 - ~~2690~~ 2670	2655 - ~~2690~~ 2670	
FIXED 364C 364D	FIXED 364C 364D	
MOBILE except aeronautical mobile	FIXED-SATELLITE (Earth-to-Space)	
BROADCASTING-SATELLITE 361B	MOBILE except aeronautical mobile	
	BROADCASTING-SATELLITE 361B	
363 364 364F ~~364G~~	364E 364F ~~364G~~	

MOD 364E: In the design of systems in the broadcasting satellite service, administrations are urged to take all necessary steps to protect the radio astronomy service in the band 2670 ~~2690~~ - 2700 MHz.

REASONS: To allow radio astronomy to share the 2670 - 2700 MHz band with other services without harmful interference. Bands are otherwise required for the continued use and expansion of the fixed and satellite services (Earth-to-Space).

2670 - 2690	2670 - 2690
MOBILE except aeronautical mobile	RADIO ASTRONOMY
FIXED 364C 364D	MOBILE except aeronautical mobile
BROADCASTING SATELLITE 361B 364E	FIXED 364C 364D
Ear. Expl. Sat. (Passive)	BROADCASTING SATELLITE 361B 364E
RADIO ASTRONOMY	FIXED SATELLITE (Earth-to-Space)
Space Res. (Passive)	Earth Exploration Satellite (Passive)
363, 364, 364F, ~~364G~~ MOD 233B	Space Research (Passive)
	364E 364F ~~364G~~ MOD 233B

MHz

Region 1	Region 2	Region 3
2690-2700	SPACE RESEARCH (Passive)	
	RADIO ASTRONOMY	
	EARTH EXPLORATION SATELLITE (Passive)	
	MOD 233B 363 364A 364B	

REASONS: Changes are necessary to permit radio astronomers the use of a wider band for continuous measurements for galactic studies of ionized hydrogen and non-thermal radio sources and afford protection from adjacent band interference. Bands are also required for the continued use and expansion of fixed and mobile services and satellite systems.

2700-2900	AERONAUTICAL RADIONAVIGATION MOD 346
	Radiolocation
	366
2900-~~3100~~ 2920	RADIONAVIGATION 367 367A 367B
	(Radar Beacons, Ship Transponders)
	Radiolocation
	367C
2920-3100	RADIONAVIGATION 367 367A 367B
	(Shipboard radars)
	Radiolocation
	367C

ADD 367C: The bands 2900-3100 MHz and 5460-5600 MHz are also allocated to the Fixed-Satellite Service for connection between one or more earth stations at specified fixed points on the earth and satellites which are used in the Maritime Mobile-Satellite Service. Such use and development shall be subject to agreement and coordination between administrations.

REASON: To provide for frequencies between ship and satellite for the use of the Maritime satellite service.

MHz

Region 1	Region 2	Region 3
3100-3300	RADIOLOCATION 346A 354 368 369 369A	

REASON: Continued and expanding use of aeronautical radionavigation and radiolocation facilities.

ADD 369A Radio astronomy observations on molecular lines of carbon hydride (CH) (rest frequencies 3263.786, 3335.475, and 3349.185 MHz) are carried out in a number of countries under national arrangements. In making assignments in the bands 3259-3269, 3331-3341, and 3344-3354 MHz, administrations are urged to take all practicable steps to prevent harmful interference, particularly from airborne and spaceborne transmitters, to radio astronomy observations.

MHz

Region 1	Region 2	Region 3
3300 - 3400 RADIOLOCATION 370 371 369A	3300 - 3400 RADIOLOCATION Amateur Mobile 376 369A	3300-3400 RADIOLOCATION Amateur 376 369A

REASON: Continued use of band by amateur and radiolocation operations. Mobile service spectrum space is urgently needed for mobile TV pickup.

3400 - 3600 3410 FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE Radiolocation Amateur-Satellite Amateur 372 373 374 375	3400 - 3500 3410 FIXED-SATELLITE (Space-to-Earth) RADIOLOCATION Amateur Amateur-Satellite 376

REASON: The band 3400 - 3410 can be shared on a secondary basis with the amateur satellite service which needs this spectrum for continued research in this field.

3410 - 3500 FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE Radiolocation 372 373 374 375	3410 - 3500 FIXED-SATELLITE (Space-to-Earth) RADIOLOCATION Amateur 376

MHz

Region 1	Region 2	Region 3
3500 - 3600 FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE Radiolocation 372 373 374 375	3500 - 3700 FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE RADIOLOCATION AERONAUTICAL RADIONAVIGATION	3500 - 3700 FIXED-SATELLITE (Space-to-Earth) RADIOLOCATION Fixed Mobile 377 378
3600 - 4800 FIXED FIXED-SATELLITE (Space-to-Earth) Mobile 374		
	3700 - 4200 FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE 379	

REASON: Continued and expanding use of fixed and mobile services and satellite Space-to-Earth links. Required for planned use for low-cost short-range radionavigation terminal radars (ASR) (satellite airports).

MHz

Region 1	Region 2	Region 3
4200 - 4400	AERONAUTICAL RADIONAVIGATION ~~378A~~ 379A 379B 381 382 383	

ADD 379B The use of the band 4200-4400 MHz by the Aeronautical Radionavigation service is reserved exclusively for airborne radio altimeters. However, Earth Exploration Satellite (Passive) and Space Research (Passive) services are allocated on a permitted basis provided that no protection will be required from the radio altimeter.

REASON: To provide for the EES and Space Research services and to restrict the Aeronautical Radionavigation Service for the exclusive use of airborne radio altimeters.

4400 - 4700	FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE
4700 - 4990 ~~4950~~	FIXED MOBILE ~~MOD 233B 354 MOD 382A 382B~~

MOD 382A Radio astronomy observations on the formaldehyde line (rest frequency 4829.649 MHz) are being carried out in a number of countries under national arrangements. ~~Administrations should bear in mind the needs of the radio astronomy service in their future planning of the 4825-4835 MHz.~~ In making assignments in the band 4825-4835 MHz, administrations are urged to take all practical steps to prevent harmful interference, particularly from airborne transmitters, to radio astronomy observations.

~~4950~~ - 4990	FIXED MOBILE RADIO ASTRONOMY ~~233B 354 382A 382B~~ 382C

ADD 382C Sharing criteria among those services operating in the band 4950-4990 MHz shall be up to the discretion of the administrations concerned.

MHz

Region 1	Region 2	Region 3
4990 - 5000	4990 - 5000	4990 - 5000
FIXED MOBILE RADIO ASTRONOMY 233B	RADIO ASTRONOMY 383A	FIXED MOBILE RADIO ASTRONOMY 233B

REASON: Expansion of the band 4990-5000 MHz also provides access to 4950-4990 MHz which is necessary to support Radio Astronomy continuum observations. If given status in the Table RRs 233B and 382B are no longer required.

MHz

5000 - 5250	AERONAUTICAL RADIONAVIGATION MOD 352A 352B 383B

REASON: Continued use for microwave landing system and distance measuring equipment.

Region 1	Region 2	Region 3
5250 - 5255	RADIOLOCATION Space Research 384 346A	
5255 - 5350	RADIOLOCATION 384 384A 346A	
5350 - 5460	AERONAUTICAL RADIONAVIGATION 385 Radiolocation	
5460 - 5470	RADIONAVIGATION 385 Radiolocation 367C	

REASON: This part of spectrum is required for continued use of radiolocation, space research, radionavigation and aeronautical radionavigation services.

MHz

Region 1	Region 2	Region 3
5470 - 5650	MARITIME RADIONAVIGATION Radiolocation 386 387 ~~387~~ 387C	
5650 - 5670	RADIOLOCATION ~~Amateur~~ Amateur-Satellite Amateur 388 389	
5670 - 5725	Amateur Space Research (Deep Space) RADIOLOCATION 388 389 389A	
5725 - 5850 ~~FIXED SATELLITE (Earth-to-Space)~~ (Space-to-Earth) RADIOLOCATION Amateur 354 388 390 391 391A 357A	5725 - 5850 FIXED-SATELLITE (Space-to-Earth) Amateur RADIOLOCATION 389 391 391A 357A	

MOD 391

REASON: Continuing need for ISM.

MHz

Region 1	Region 2	Region 3
5850 - 5925 FIXED FIXED SATELLITE ~~(Earth-to-Space)~~ (Space-to-Earth) MOBILE 391	5850 - 5925 FIXED-SATELLITE (Space-to-Earth) Amateur RADIOLOCATION 391	5850 - 5925 FIXED FIXED SATELLITE ~~(Earth-to-Space)~~ (Space-to-Earth) MOBILE Radiolocation 391
5925 - 6425	FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE	

REASON: Continued use of fixed, mobile and fixed satellite services.

6425 - ~~7250~~ 6925	FIXED MOBILE FIXED SATELLITE (Earth-to-Space) 379A ~~392AA~~ ~~392B~~ 393 393A

ADD 393A In the band 6.425-7.125 GHz, passive microwave sensor measurements are carried out over the Earth's oceans. Administrations should bear in mind the needs of the earth exploration satellite (passive) and space research (passive) services in their future planning of this band.

cy.

MHz		
Region 1	Region 2	Region 3
6925-7250		
	FIXED MOBILE	
	379A	392B 393 MOD 392AA 393A

MOD 392AA In Brazil, Canada and the United States of America, the band 6625 - 7125 MHz is also allocated on a secondary basis, to the fixed-satellite service for space-to-Earth transmissions. In Region 2, the power flux density produced by space stations in this band shall be in accordance with the provisions of No. 470NM. In Regions 1 and 3, it shall be at least 6 dB lower. Receiving earth stations in this band may not impose restrictions on the locations or technical parameters of existing or future terrestrial stations of other countries.

Reason: Consequential to allocation change.

MHz		
Region 1	Region 2	Region 3
7250-7300		
	FIXED-SATELLITE (Space-to-Earth)	
	392D 392G	
7300-7450		
	FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE	
	392D	
7450-7550		
	FIXED FIXED-SATELLITE (Space-to-Earth) METEOROLOGICAL-SATELLITE (Space-to-Earth) MOBILE	
	392D	
7550-7750		
	FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE	
	392D	

90.

MHz		
Region 1	Region 2	Region 3
7750-7900		
	FIXED MOBILE	

MHz

Region 1	Region 2	Region 3
7900 - 7975	FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE	
7975 - 8025	FIXED-SATELLITE (Earth-to-Space) 392M	
8025 - 8175 FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE Earth Exploration-Satellite (Space-to-Earth) 394B	8025 - 8175 EARTH EXPLORATION-SATELLITE (Space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE	8025 - 8175 FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE Earth Exploration-Satellite (Space-to-Earth)
8175 - 8215 FIXED FIXED-SATELLITE (Earth-to-Space) METEOROLOGICAL-SATELLITE (Earth-to-Space) MOBILE Earth Exploration-Satellite (Space-to-Earth) 394B	8175 - 8215 EARTH EXPLORATION-SATELLITE (Space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-Space) METEOROLOGICAL-SATELLITE (Earth-to-Space) MOBILE	8175 - 8215 FIXED FIXED-SATELLITE (Earth-to-Space) METEOROLOGICAL-SATELLITE (Earth-to-Space) MOBILE Earth Exploration-Satellite (Space-to-Earth)

MHz

Region 1	Region 2	Region 3
8215 - 8400 FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE Earth Exploration-Satellite (Space-to-Earth) 394 394B	8215 - 8400 EARTH EXPLORATION-SATELLITE (Space-to-Earth) FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE	8215 - 8400 FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE Earth Exploration Satellite (Space-to-Earth) 394

REASON: Continued need for existing service.

8400 - 8500	FIXED MOBILE except aeronautical mobile (R) SPACE RESEARCH (Space-to-Earth) (deep space only) Land Mobile Satellite (Earth-to-Space) 394A 394D
8500 - 8750	RADIOLOCATION 354 395
8750 - 8850	RADIOLOCATION AERONAUTICAL RADIONAVIGATION 396 397

REASON: Continuing need for existing service.

8850 - 9000	RADIOLOCATION 397 398
9000 - 9200	AERONAUTICAL RADIONAVIGATION MOD 346 Radiolocation 397

MHz

Region 1	Region 2	Region 3
9200 - 9300	RADIOLOCATION 397 398	
REASON: Continuing need for existing services.		
9300 - 9500	RADIONAVIGATION 367A 367B Radiolocation 399	
9500 - 9800	RADIOLOCATION 398 346A	
9800 - 10000	RADIOLOCATION Fixed 400 401 401A	
10000 - 10500	RADIOLOCATION Amateur 401A 402 403	

GHz

Region 1	Region 2	Region 3
10.5 - 10.55 FIXED MOBILE Radiolocation	10.5 - 10.55 RADIOLOCATION 404	
REASON: Continued need for existing services.		
NOC 404		
REASON: Preserve system compatibility.		
10.55 - 10.6	FIXED MOBILE Except Aeronautical Mobile Radiolocation	
10.6 - 10.68	FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY Radiolocation 404A 404B	
10.68 - 10.7	FIXED MOBILE except aeronautical mobile RADIO ASTRONOMY ~~405B~~ 404B	
SUP 405B Consequential to allocation change. ADD 404B All airborne emissions are excluded.		
REASON: Radio astronomy can share the 10.6 - 10.7 continuum band as long as airborne transmissions are excluded from the mobile and radiolocation services. The bands above are otherwise needed for continued and expanding use of the fixed, mobile and radiolocation services.		
10.7 - 10.95	MOBILE FIXED FIXED SATELLITE (Space-to-Earth)	
REASON: This frequency band is currently in considerable use in the radio-relay service in the United States. The fixed-satellite allocation is needed on a world-wide basis.		

GHz

Region 1	Region 2	Region 3
10.95 - 11.2 FIXED MOBILE FIXED-SATELLITE (Space-to-Earth) ~~(Earth-to-Space)~~	10.95 - 11.2 FIXED MOBILE FIXED-SATELLITE (Space-to-Earth)	

REASON: Unidirectionality needed for compatibility.

11.2 - 11.45	FIXED MOBILE FIXED-SATELLITE (Space-to-Earth)

REASON: This frequency band is currently in considerable use in the radio-relay service in the United States. The fixed-satellite allocation is needed on a world-wide basis.

11.45 - 11.7	FIXED MOBILE FIXED-SATELLITE (Space-to-Earth)

REASON: Mobile allocation not needed.

11.7 - 12.5 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE — 405EA	11.7 - 12.2 ~~FIXED~~ Mobile~~MOBILE~~ except aeronautical mobile ~~BROADCASTING~~ BROADCASTING-SATELLITE FIXED-SATELLITE (Space-to-Earth) 405EB 405BC	11.7 - 12.2 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE 405BA

GHz

Region 1	Region 2	Region 3

REASON: Satellite communications are envisaged to large numbers of inexpensive earth stations widely dispersed throughout the United States. TV mobile pick-up service is currently provided in this band on a secondary basis.

SUP 405EB

REASON: To enhance versatility in use of this band.

	12.2 - 12.5 FIXED MOBILE except aeronautical mobile BROADCASTING BROADCASTING-SATELLITE	

REASON: To meet the projected requirements of the Broadcasting-Satellite Service.

12.5 - 12.75 FIXED-SATELLITE ~~(Space-to-Earth)~~ (Earth-to-Space) 405ED 405BE	12.5 - 12.75 FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE except aeronautical mobile	12.5 - 12.75 FIXED FIXED-SATELLITE ~~(Space-to-Earth)~~ (Earth-to-Space) MOBILE except aeronautical mobile

REASON: Unidirectionality needed for compatibility.

12.75 - 13.25	FIXED-SATELLITE (Earth-to-Space) FIXED MOBILE SPACE RESEARCH (deep space only) (Space-to-Earth)

REASON: Continuing need for existing services. The Fixed-Satellite Service is needed on a worldwide basis. Space research for reception at selective sites.

13.25 - 13.4	Space Research AERONAUTICAL RADIONAVIGATION 406 407 407A

REASON: Required for airborne doppler radar.

SUP 407A
Reason: Consequential to allocation change

GHz

Region 1	Region 2	Region 3
13.4 - 14	Earth Exploration Satellite (Active Sensors) Standard Frequency Satellite (Earth-to-Space) RADIOLOCATION Space Research 407 ~~407A~~ 408 409	
14 - ~~14.3~~ 14.2	Space Research FIXED SATELLITE (Earth-to-Space) RADIONAVIGATION MOD 408A 407 ~~407A~~	
14.2 - 14.3	FIXED SATELLITE (Earth-to-Space) RADIONAVIGATION MOD 408A 407 ~~407A~~	

REASON: This frequency band is currently used for marine radar. This frequency band will be used for long-haul and international voice and data channel communications. The band 13.4-14 is required for radiolocation type active sensors.

MOD 408A Spa2 The use of the bands 14-14.3 GHz and ~~14.3-14.4 GHz~~ by the radionavigation service ~~and radionavigation satellite service respectively~~, shall be such as to provide sufficient protection to space stations of the fixed-satellite service (see Recommendation No. Spa2 - 15, paragraph 2.14).

REASON: Consequential to allocation change.

14.3 - 14.4	FIXED-SATELLITE (Earth-to-Space) ~~RADIONAVIGATION-SATELLITE~~ ~~408A~~
14.4 - 14.5	Space Research (Space to-Space) MOBILE FIXED FIXED-SATELLITE (Earth-to-Space) ~~408B~~, MOD 408C

Reason: These bands will be used for the domestic and international voice and data channel communications. The bands 13.25-14.2 and 14.4-14.5 GHz will be used for space research.

MOD 408C Radio astronomy observations on the formaldehyde line (rest frequency 14489 GHz) are being carried out in a number of countries under national arrangements. In making assignments to stations in the fixed and mobile other services, administrations are urged to take all practicable steps to protect radio astronomy observations from harmful interference, particularly from airborne or spaceborne transmitters, in the band ~~14.488 14.515~~ 14.473-14.503 GHz.

~~MOD 408B~~
~~REASON:~~ Consequential to allocation change.

GHz

Region 1	Region 2	Region 3
14.5 - 15.2	FIXED MOBILE Space Research ~~408B~~ MOD 408C	
15.2 - 15.35	FIXED MOBILE Space Research Earth Exploration Satellite (Passive) ~~408B~~ 408G	
15.35 - 15.4	EARTH EXPLORATION SATELLITE (PASSIVE) SPACE RESEARCH (PASSIVE) RADIO ASTRONOMY 409C	
15.4 - 15.7	AERONAUTICAL RADIONAVIGATION SATELLITE AERONAUTICAL RADIONAVIGATION MOD 352A 352B 407	

REASON: Other passive services can share the band 15.35 - 15.40 GHz. The band 15.4 - 15.7 GHz is required for continued and expanded use for microwave landing system (MLS) and airborne weather radar.

15.7 - 16.6	RADIOLOCATION 407 408 409CA

REASON: The frequency band is required for radiolocation.

16.6 - 17.1	SPACE RESEARCH (DEEP SPACE ONLY)(EARTH-TO-SPACE) RADIOLOCATION 407 408

ADD 409CA In the U.S., the portion 15.7-16.2 GHz may be used also for Airport Surface Detection Equipment (ASDE).

GHz		
Region 1	Region 2	Region 3
17.1 - 17.25	RADIOLOCATION 407 408	
17.25 - 17.7	EARTH EXPLORATION SATELLITE (ACTIVE SENSORS) SPACE RESEARCH (ACTIVE SENSORS) RADIOLOCATION 407 408	
17.7 - 17.9	FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE	
17.9 - 18.7	METEOROLOGICAL SATELLITE (Space-to-Earth) FIXED-SATELLITE (Space-to-Earth) FIXED MOBILE	
18.7 - 19.7	FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE	

Reason: Required for read out of telemetry from meteorological satellite.

REASON: Space services listed appear to be compatible with existing services

GHz				
Region 1	*	Region 2	*	Region 3
19.7 - 21.2 20.2		FIXED-SATELLITE (Space-to-Earth) 409E		
20.2 - 21.2		FIXED-SATELLITE (Space-to-Earth) MOBILE-SATELLITE (Space-to-Earth) Standard Frequency Satellite (Space-to-Earth) 409E		

Reason: Required for Mobile-Satellite sharing.

GHz

Region 1	Region 2	Region 3
21.2 - 21.4	SPACE RESEARCH (Passive) EARTH EXPLORATION SATELLITE (Passive) ~~(Space-to-Earth)~~ FIXED MOBILE	
21.4 - 21.7	~~EARTH-EXPLORATION-SATELLITE (Space-to-Earth)~~ FIXED MOBILE INTER-SATELLITE	
21.7 - 22	FIXED MOBILE ~~EARTH-EXPLORATION-SATELLITE (Space-to-Earth)~~	

REASON: This band will be used for terrestrial radio relay and for land mobile experimental, developmental and research uses and for satellite-to-satellite communications.

22 - ~~22.5~~ 22.21	FIXED MOBILE 410A	

REASON: This frequency band will be used for terrestrial radio relay and for land mobile experimental, developmental and research uses.

22.21 - 22.5	FIXED MOBILE (except aeronautical mobile) EARTH EXPLORATION SATELLITE (Passive) SPACE RESEARCH (Passive) RADIO ASTRONOMY 410A	

REASON: This frequency band will be used for radio astronomy observations of the water vapor line (rest frequency 22.235 GHz) and for terrestrial radio relay service and for land mobile experimental, developmental and research uses.

SUP 410A

REASON: Consequential to allocation changes.

GHz

Region 1	Region 2	Region 3
22.5 ~~23.0~~ 22.7	FIXED MOBILE	22.5 - 23.0 22.7 FIXED MOBILE BROADCASTING-SATELLITE MOD 410B

REASON: This frequency band will be used for terrestrial radio relay systems and for land mobile experimental, developmental and research uses.

MOD 410B Spa2	In Region 3, the broadcasting-satellite service is authorised in the band 22.5-~~23.0~~ 22.7 GHz, subject to power flux density limits for the protection of the terrestrial services in this band.

GHz

Region 1	Region 2	Region 3
22.7 - 23 FIXED MOBILE INTER-SATELLITE ADD 410D		22.7 - 23 FIXED MOBILE INTER-SATELLITE ~~BROADCASTING-SATELLITE~~ ~~410B~~ ADD 410D

REASON: This frequency band will be used for communications between satellites.

ADD 410D The bands 22.81-22.86 GHz, 23.07-23.12 GHz and 24.11-24.16 GHz are also allocated to the Radio Astronomy service for observations of spectral lines due to Ammonia (rest frequencies 22.834, 23.098 and 24.139 GHz).

23 - 23.6	FIXED MOBILE 410D

REASON: This frequency band will be used for terrestrial microwave and operational fixed users.

23.6 - 24	EARTH EXPLORATION SATELLITE (PASSIVE) SPACE RESEARCH (PASSIVE) RADIO ASTRONOMY 407

REASON: This is a very important continuum band that also covers the important ammonia (NH_3) lines. Passive space services can share.

24 - 24.05	AMATEUR AMATEUR-SATELLITE 410C

REASON: To promote national and international exchange of thoughts and ideas.

GHz

Region 1	Region 2	Region 3
24.05 - 24.25	RADIOLOCATION Amateur 410C 407 410D	

REASON: To promote exchange of thoughts and ideas.

24.25 - 25.25	RADIONAVIGATION 411 412

REASON: Required for existing radionavigation.

25.25 - 27.5	Standard Frequency Satellite (Earth-to-Space) FIXED MOBILE EARTH EXPLORATION SATELLITE (Space-to-Space)

27.5 - 29.5	FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE 411A

REASON: To provide an uplink band to pair with the band around 20 GHz. This frequency band will be used for the terrestrial radio relay system.

29.5 - 30	FIXED-SATELLITE (Earth-to-Space) 409E 411A

30 - 31	FIXED-SATELLITE (Earth-to-Space) MOBILE-SATELLITE (Earth-to-Space) Standard Frequency Satellite (Space-to-Earth) 409E

ADD 411A: Within the frequency band 27.5-30 GHz, a 50 MHz wide band may be used for space-to-space communications in the earth exploration satellite service for telemetry, tracking and control purposes.

GHz

Region 1	Region 2	Region 3
31 - 31.3	Standard Frequency Satellite (Space-to-Earth) FIXED MOBILE Space Research 412H 412I	
31.3 -31.5	SPACE RESEARCH (PASSIVE SENSOR) EARTH EXPLORATION SATELLITE (PASSIVE SENSOR) RADIO ASTRONOMY 412A	
31.5 - 31.8 SPACE RESEARCH (PASSIVE) Fixed Mobile except aeronautical mobile RADIO ASTRONOMY EARTH EXPLORATION SATELLITE (PASSIVE)	31.5 - 31.8 SPACE RESEARCH (PASSIVE) RADIO ASTRONOMY EARTH EXPLORATION SATELLITE (PASSIVE) 405C	31.5 - 31.8 SPACE RESEARCH (PASSIVE) Fixed Mobile except aeronautical mobile RADIO ASTRONOMY EARTH EXPLORATION SATELLITE (PASSIVE)
REASON: The frequency region 31.3-31.8 GHz is the first atmospheric window in the millimeter radio regions where observations can be made. This spectral region has been very useful in defining the high frequency continuum spectra of galactic and extragalactic objects. Passive services can share with Radio Astronomy.		
31.8 - 32.3	RADIONAVIGATION Space Research 412B	
32.3 - 33	RADIONAVIGATION	
33 - 33.4 RADIO ASTRONOMY RADIONAVIGATION	33 - 33.4 RADIONAVIGATION 412F	
REASON: Required for sweep radar for small aircraft.		
33.4 - 34.2	RADIOLOCATION 407 408 412 412G	

GHz

Region 1	Region 2	Region 3
34.2 - 35.2	RADIOLOCATION Space Research SPACE RESEARCH (ACTIVE SENSORS) METEOROLOGICAL AIDS EARTH EXPLORATION SATELLITE (ACTIVE SENSORS) 407 408 412 412C 412D	
REASON: Required for radiolocation type sensors and meteorological aids radar.		
35.2 - 36	RADIOLOCATION 407 408 412	
36 - 40 3I	FIXED MOBILE SPACE RESEARCH (PASSIVE) EARTH EXPLORATION SATELLITE (PASSIVE) 391A 412E	
3I - 40	FIXED MOBILE 391A 412E	
40 - 41	FIXED-SATELLITE (Space-to-Earth) FIXED MOBILE MOBILE-SATELLITE (Space-to-Earth)	
REASON: This band will be used for terrestrial systems and shared with the mobile- and fixed-satellite services.		
41 - 43	BROADCASTING-SATELLITE FIXED MOBILE ADD 412L	

GHz			
Region 1	*	Region 2	* Region 3
43- 48 - 45			
		AERONAUTICAL-MOBILE-SATELLITE MARITIME MOBILE SATELLITE AERONAUTICAL RADIONAVIGATION SATELLITE MARITIME-RADIONAVIGATION SATELLITE FIXED-SATELLITE (Earth-to-Space) MOBILE-SATELLITE (Earth-to-Space) 412L	
Reason: To satisfy requirements.			
45-48			
		AERONAUTICAL MOBILE AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE MARITIME MOBILE-SATELLITE AERONAUTICAL RADIONAVIGATION AERONAUTICAL RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION MARITIME RADIONAVIGATION-SATELLITE	
Reason: This frequency band will be used for communicating to ships and aircraft for position determination and surveillance.			
48-49.8		AERONAUTICAL MOBILE AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE MARITIME MOBILE-SATELLITE AERONAUTICAL RADIONAVIGATION AERONAUTICAL RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION MARITIME RADIONAVIGATION-SATELLITE ADD 412II	
ADD 412II Radio Astronomy observations on molecular lines of carbon sulfide (CS) (rest 48.991, 97.981 and 146.969 GHz) are being carried out in a number of countries under national arrangements. In making assignments in the bands 48.94-49.04, 97.88-98.08, and 146.82-147.12 GHz, administrations are urged to prevent harmful interference, particularly from airborne and spaceborne transmissions, to radio astronomy observations.			
49.8-50		AMATEUR AMATEUR-SATELLITE	
50- 51 - 50.4			
		FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE	
Reason: This frequency band will be used by the terrestrial systems.			

Reason: This frequency band will be used for terrestrial system.

ADD 412I Radio astronomy observations on the silicon monoxide lines are carried on in a number of countries under national arrangements. In making assignments _____, administrations are urged _____ to protect radio astronomy observations from harmful interference, particularly from airborne or spaceborne transmitters, in the 42.77 - 42.87, 43.07-43.17, and 43.37 - 43.47 GHz bands.

GHz		
Region 1	Region 2	Region 3
50.2 - 50.4	FIXED FIXED-SATELLITE (Earth-to-Space) MOBILE SPACE RESEARCH (Passive) EARTH EXPLORATION SATELLITE (Passive)	

GHz				
Region 1	*	Region 2	*	Region 3
50.4 - 51		FIXED-SATELLITE (Earth-to-Space) FIXED MOBILE MOBILE-SATELLITE (Earth-to-Space)		
51 - 52-51.4		EARTH-EXPLORATION-SATELLITE SPACE RESEARCH FIXED MOBILE FIXED-SATELLITE (Earth-to-Space) MOBILE-SATELLITE (Earth-to-Space)		

Reason: Required to satisfy multiple services.

51.4-52	EARTH EXPLORATION-SATELLITE (Passive) SPACE RESEARCH (Passive) MOD 412J

Reason: This frequency band will continue to be used to explore the resources of the Earth by satellite techniques.

52-54.25	EARTH EXPLORATION-SATELLITE (Passive) SPACE RESEARCH (Passive) MOD 412J

Reason: This frequency band will continue to be used in conducting research work in space.

MOD 412J All emissions in the bands 51.4-52 GHz, 52-54.25 GHz, 58.2-59 GHz, 64-65 GHz, 86-92 GHz, 101-102 GHz, 105-116 GHz, 130-140 GHz, 182-185 GHz, and 230-240 GHz are prohibited. The use of passive sensors by other services is also authorized.

GHz		
Region 1	Region 2	Region 3
54.25 - 58.2	SPACE RESEARCH (Passive) FIXED MOBILE INTER-SATELLITE EARTH EXPLORATION SATELLITE (Passive)	

REASON: This frequency band will be used for terrestrial systems, and space services as shown.

58.2 - 59	EARTH EXPLORATION SATELLITE (Passive) SPACE RESEARCH (passive) MOD 412J	

REASON: This frequency band will continue to be used for conducting research in space.

59 - 64	FIXED MOBILE INTER-SATELLITE ADD 410E	

REASON: This frequency band will be used for terrestrial service and for satellite-to-satellite communications.

ADD 410E The frequency 61.25 GHz is designated for industrial, scientific and medical purposes. Emissions must be confined within the limits of ± 250 MHz of that frequency. Radiocommunication services operating within these limits must accept any harmful interference that may be experienced from the operation of industrial, scientific and medical equipment.

REASON: New applications; heating of small fibers and pellets; insect control; host of specific biological applications based on recent evidence of frequency specific effects.

64 - 65	SPACE RESEARCH (Passive) EARTH EXPLORATION SATELLITE (Passive) MOD 412J	

GHz		
Region 1	Region 2	Region 3

REASON: This frequency band will be used for conducting passive research in space.

65 - 66	EARTH EXPLORATION-SATELLITE SPACE RESEARCH	

REASON: This frequency band will be used for exploring the resources of the earth by satellite techniques.

66 - 71	AERONAUTICAL MOBILE AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE MARITIME MOBILE-SATELLITE AERONAUTICAL RADIONAVIGATION AERONAUTICAL RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION MARITIME RADIONAVIGATION-SATELLITE	

REASON: This frequency band will be used for maritime and aeronautical mobile services.

71- 84 - 72	EARTH EXPLORATION SATELLITE (Active Sensors) SPACE RESEARCH (Active Sensors) RADIOLOCATION Amateur Amateur-Satellite	

Reason: Band required for services specified.

72-76	RADIOLOCATION Amateur Amateur-Satellite ADD 412M	

Reason: This frequency band will be used for amateur services to promote national and international exchange of thoughts and ideas.

ADD 412M Radio astronomy observations on the H_2CO formaldehyde lines are being carried out by a number of countries under national arrangements. In making assignments, administrations are urged to protect radio astronomy observations from harmful interference in the 72.35-72.45, 140.6-141, 145.45-145.75, and 150.35-150.65 GHz bands.

GHz	Region 1	*	Region 2	*	Region 3
76-72			MOBILE-SATELLITE (Space-to-Earth) FIXED-SATELLITE (Space-to-Earth) FIXED MOBILE		
72-80			FIXED-SATELLITE (Space-to-Earth) FIXED MOBILE		
80-81			FIXED-SATELLITE (Earth-to-Space) FIXED MOBILE		
81-84			MOBILE-SATELLITE (Earth-to-Space) FIXED-SATELLITE (Earth-to-Space) FIXED MOBILE		

Reason: These frequency bands will be used for terrestrial and space services.

84-86			BROADCASTING-SATELLITE FIXED MOBILE		

Reason: This frequency band will be used for terrestrial services and for providing service to multi-destination low cost users.

86-92			EARTH EXPLORATION-SATELLITE (Passive) RADIO ASTRONOMY SPACE RESEARCH (Passive) MOD 412J		

Reason: This frequency band will be used for radio astronomy observations and for conducting passive research in space.

92-95			RADIOLOCATION FIXED-SATELLITE (Earth-to-Space) FIXED MOBILE ADD 412N		

Reason: The frequency band will be used for terrestrial services and transmission of voice, data, television signals by satellites. Also required for Radiolocation.

ADD 412M Radio astronomy observations on the Dinitrogen Hydronium line are being carried out on a number of countries under national arrangements. In making assignments administrations are urged to protect radio astronomy observations in the band 93.12 to 93.22 GHz from harmful interference.

GHz

Region 1	Region 2	Region 3
95 - ~~100~~ 100	Radiolocation AERONAUTICAL MOBILE AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE MARITIME MOBILE-SATELLITE AERONAUTICAL RADIONAVIGATION AERONAUTICAL RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION MARITIME RADIONAVIGATION-SATELLITE ADD 412II	
100 - 101	SPACE RESEARCH (Passive) EARTH EXPLORATION SATELLITE (Passive) AERONAUTICAL MOBILE AERONAUTICAL RADIONAVIGATION MARITIME MOBILE MARITIME RADIONAVIGATION AERONAUTICAL MOBILE SATELLITE AERONAUTICAL RADIONAVIGATION SATELLITE MARITIME MOBILE SATELLITE MARITIME RADIONAVIGATION SATELLITE Radiolocation	

REASON: This frequency band will be used for ship and aircraft communications, position determination and air traffic control.

101 - 102	EARTH EXPLORATION SATELLITE (Passive) SPACE RESEARCH (Passive) MOD 412J	

REASON: This frequency band will be used for conducting passive research in space.

102 - 105	FIXED-SATELLITE (Space-to-Earth) FIXED MOBILE	

REASON: This frequency band will be used for terrestrial services and for transmission of voice, data, television signals by satellite.

105 - ~~130~~ 116	EARTH EXPLORATION-SATELLITE (Passive) ~~INTERSATELLITE~~ RADIO ASTRONOMY SPACE RESEARCH (Passive) MOD 412J 412K	

REASON: This frequency band will be used for radio astronomy observations of the carbon monoxide lines and for conducting passive research in space.

GHz		
Region 1	Region 2	Region 3
116 - 126	SPACE RESEARCH (Passive) EARTH EXPLORATION SATELLITE (Passive) INTER-SATELLITE FIXED MOBILE 412K 410F	
126 - 130	INTER-SATELLITE FIXED MOBILE 412K	

REASON: This frequency band will be used for communications between satellites and for terrestrial radio relay service.

SUP 412K

REASON: Consequential to reallocation.

ADD 410F The frequency 120 GHz is designated for industrial, scientific and medical purposes. Emissions must be confined within the limits of ± 500 MHz of that frequency. Radiocommunication services operating within these limits must accept any harmful interference that may be experienced from the operation of industrial, scientific and medical equipment.

REASON: New applications; heating of small fibers and pellets; insect control; host of specific biological applications based on recent evidence of frequency specific effects.

130 - 140	INTER-SATELLITE FIXED MOBILE RADIO-ASTRONOMY SPACE-RESEARCH-(passive) 412J

REASON: This frequency band will be used for communications between satellites and for terrestrial services.

140 - 142	FIXED-SATELLITE (Earth-to-Space) (Space-to-Earth) FIXED MOBILE ADD 412M

REASON: This frequency band will be used for terrestrial services and for transmission of voice, data and television signals by satellite.

GHz		
Region 1	Region 2	Region 3
142 - 150	Radiolocation AERONAUTICAL MOBILE AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE MARITIME MOBILE-SATELLITE AERONAUTICAL RADIONAVIGATION AERONAUTICAL RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION MARITIME RADIONAVIGATION-SATELLITE ADD 412O ADD 412M ADD 412U	

REASON: This frequency band will be used for ship, aircraft communications, position determination and for air traffic control.

ADD 412O Radio astronomy observations on the deuterated cyanide line are being carried out in a number of countries under national arrangements. In making assignments to stations in the mobile services, administrations are urged to protect radio astronomy observations from harmful interference in the 144.68-144.98 GHz band.

150 - 151	FIXED-SATELLITE (Space-to-Earth) FIXED MOBILE SPACE RESEARCH (Passive) EARTH EXPLORATION SATELLITE (Passive) ADD 412M

REASON: This frequency will be used for terrestrial and space services.

151 - 152	FIXED-SATELLITE (Space-to-Earth) FIXED MOBILE ADD 412M

REASON: This frequency band will be used for terrestrial services and for communication of voice, data, television signals by satellites.

GHz

Region 1	Region 2	Region 3
152 - 164	FIXED MOBILE FIXED-SATELLITE (Space-to-Earth)	
164 - 165	FIXED MOBILE FIXED-SATELLITE (Space-to-Earth) SPACE RESEARCH (Passive) EARTH EXPLORATION SATELLITE (Passive)	

REASON: These frequency bands will be used for terrestrial and space services.

165 - 168	RADIOLOCATION Amateur Amateur-Satellite SPACE RESEARCH (Passive) EARTH EXPLORATION SATELLITE (Passive)

REASON: This frequency band is proposed to be used for Radiolocation, Amateur and space services.

168 - 170	RADIOLOCATION Amateur Amateur-Satellite

REASON: This frequency band will be used for determining position of objects and for amateurs to promote national and international exchange of thoughts and ideas.

GHz

Region 1	* *	Region 2	* *	Region 3
170-182 174.5		FIXED MOBILE except aeronautical mobile INTER-SATELLITE		

Reason: This frequency band will be used for terrestrial services.

174.5 - 176.5	INTERSATELLITE EARTH EXPLORATION SATELLITE (Passive) SPACE RESEARCH (Passive) FIXED MOBILE (except Aeronautical Mobile) ADD 412P

Reason: This band required for both terrestrial and space services as shown.

ADD 412P Radio astronomy observations on the ethynyl radical line, hydrogen cyanide line, formyl ion line, hydrogen isocyanide line, and dinitrogen hydronium line are being carried out in a number of countries under national arrangements. In making assignments, administrations are urged to protect radio astronomy observations from harmful interference in the 174.42-175.02, 177-177.4, 178.2-178.6, 181-181.4, and 186.2-186.6 GHz bands.

176.5 - 182	FIXED MOBILE except aeronautical mobile INTER-SATELLITE ADD 412P

Reason: This frequency band will be used for terrestrial services and for communications between satellites.

GHz		
Region 1	Region 2	Region 3
182 - 185	EARTH EXPLORATION SATELLITE (Passive) SPACE RESEARCH (Passive) RADIO ASTRONOMY MOD 412J	

Reason: This frequency band will be used for radio astronomy observations of water vapor line and for conducting passive research in space.

185- 190	FIXED INTER-SATELLITE MOBILE ADD 412P

Reason: This frequency band will be used for terrestrial services and for communications between satellites.

GHz		
Region 1	Region 2	Region 3
190 - 200 195	AERONAUTICAL MOBILE AERONAUTICAL MOBILE-SATELLITE ~~MARITIME MOBILE-SATELLITE~~ AERONAUTICAL RADIONAVIGATION AERONAUTICAL RADIONAVIGATION-SATELLITE ~~MARITIME RADIONAVIGATION-SATELLITE~~	

REASON: This frequency band will be used for aircraft communications and position determination and for air traffic control.

195-200	AERONAUTICAL MOBILE-SATELLITE MARITIME MOBILE-SATELLITE AERONAUTICAL-RADIONAVIGATION-SATELLITE MARITIME RADIONAVIGATION-SATELLITE MARITIME MOBILE MARITIME RADIONAVIGATION

Reason: This frequency band will be used for ship communications and position determination and for air traffic control.

200- 220 201.5	FIXED MOBILE SPACE RESEARCH (Passive) EARTH EXPLORATION SATELLITE (Passive)

REASON: This frequency will be used for terrestrial and space services.

Region 1	GHz Region 2	Region 3
201.5-217	FIXED-SATELLITE (Earth-to-Space) FIXED MOBILE	
217-220	FIXED MOBILE (except aeronautical mobile) RADIO ASTRONOMY	

Reason: This frequency band will be used for terrestrial services and for radio astronomy observations.

220-230 221	FIXED-SATELLITE FIXED MOBILE (except aeronautical mobile) RADIO ASTRONOMY	

Reason: This frequency band will be used for communications of voice, data and television signals by satellite and for terrestrial systems and for radio astronomy observations.

Region 1	GHz Region 2	Region 3
221 - 225	FIXED-SATELLITE (Space-to-Earth) FIXED MOBILE Radiolocation	
225 - 227	FIXED-SATELLITE (Space-to-Earth) FIXED MOBILE SPACE RESEARCH (Passive) EARTH EXPLORATION SATELLITE (Passive) Radiolocation	
227 - 229	FIXED-SATELLITE (Space-to-Earth) FIXED MOBILE Radiolocation	

REASON: This frequency band will be used for communications of voice, data and television signals by satellite and for terrestrial systems.

229 - 230	FIXED-SATELLITE FIXED MOBILE RADIO ASTRONOMY SPACE RESEARCH (Passive) EARTH EXPLORATION SATELLITE (Passive)	

REASON: This frequency band will be used for communications of voice, data, and television signals by satellite, for terrestrial systems and for radio astronomy observations.

GHz

Region 1	Region 2	Region 3
230 - 240	EARTH EXPLORATION SATELLITE (Passive) RADIO ASTRONOMY SPACE RESEARCH (Passive) MOD 412J	

REASON: This frequency band will be used for radio astronomy observations and for conducting passive research in space.

240 - 250	RADIOLOCATION FIXED MOBILE Amateur Amateur-Satellite ADD 4100

GHz

Region 1	Region 2	Region 3

REASON: This frequency will be used to determine the location of objects and for the amateur service to promote national and international exchange of thoughts and ideas.

ADD 4100 The frequency 248 GHz is designated for industrial, scientific and medical purposes. Emissions must be confined within the limits of ± 500 MHz of that frequency. Radiocommunication services operating within these limits must accept any harmful interference that may be experienced from the operation of industrial, scientific and medical equipment.

REASON: New applications; heating of small fibers and pellets; insect control; host of specific biological applications based on recent evidence of frequency specific effects.

250 - 252	EARTH EXPLORATION SATELLITE (Passive) SPACE RESEARCH (Passive) AERONAUTICAL MOBILE AERONAUTICAL MOBILE - SATELLITE AERONAUTICAL RADIONAVIGATION AERONAUTICAL RADIONAVIGATION - SATELLITE MARITIME RADIONAVIGATION MARITIME RADIONAVIGATION - SATELLITE MARITIME MOBILE MARITIME MOBILE - SATELLITE
252 - 265	AERONAUTICAL MOBILE AERONAUTICAL MOBILE - SATELLITE MARITIME MOBILE MARITIME MOBILE - SATELLITE AERONAUTICAL RADIONAVIGATION AERONAUTICAL RADIONAVIGATION - SATELLITE MARITIME RADIONAVIGATION MARITIME RADIONAVIGATION - SATELLITE ADD 4129

REASON: This frequency band will be used by ships and aircraft for communications, and for position determination and for air traffic control.

GHz

Region 1	Region 2	Region 3
ADD 5.129 Radio astronomy observations on the CaH, HCN, HCO+, HNC, and H_2O lines are being carried out in a number of countries under national arrangements. In making assignments, administrations are urged to protect radio astronomy observations from harmful interference, particularly from airborne or spaceborne transmitters, in the frequencies 262.5 GHz, 265.9 GHz, 267.6 GHz, 272.0 GHz, and 279.5 GHz.		
265 - 275	FIXED-SATELLITE (Earth-to-Space) FIXED MOBILE ADD 5.129	
REASON: This frequency band will be used by the terrestrial services and for communications of voice, data and television signals by satellites.		
275 - 277	FIXED MOBILE SPACE RESEARCH (Passive) EARTH EXPLORATION-SATELLITE (Passive)	
277 - 300	FIXED MOBILE ADD 5.129	
Above 300 GHz not allocated.		

APPENDIX 3.—PROPOSAL FOR INTERNATIONAL RADIO REGULATIONS AND APPENDICES (OTHER THAN ARTICLE 5)

Article 3

GENERAL RULES FOR THE ASSIGNMENT AND USE OF FREQUENCIES

NOC
NOC 113
NOC 114
NOC 115
MOD 116

§4. The frequency assigned to a station of a given service shall be separated from the limits of the band allocated to this service in such a way that, taking account of the frequency band assigned to a station, no harmful interference is caused to services to which frequency bands immediately adjoining are allocated. *If a service allocated to an immediately adjoining frequency band is reportedly subject to harmful interference caused by a station whose occupied bandwidth is not wholly contained within the band allocated to the service rendered by that station, it shall be regarded as not complying with this provision.*

Article 6

NOC

SPECIAL RULES FOR THE ASSIGNMENT AND USE OF FREQUENCIES

(MOD) 413

Members [and Associate Members] of the Union . . .

NOC 414
NOC 415
NOC 416
NOC 417 through 421

Article 7

SPECIAL RULES RELATING TO PARTICULAR SERVICES

NOC 422

Reason: Necessary and adequate as drafted.

MOD 423

[In principle, except in the frequency band 3900–4000 kHz] Broadcasting stations using frequencies below [5060] *4063* kHz or above *26,100 kHz* [41 MHz] shall not employ power exceeding that necessary to maintain economically an effective national service of good quality within the frontiers of the country concerned.

NOC 424 through 428
NOC 428A
ADD

Section IB. Broadcast Service in Band 7

ADD *428B*

To enhance sharing possibilities and to improve receiving conditions, broadcasting stations operating in Band 7, while complying with the provisions of No. 694, shall in no event employ an effective radiated power on any azimuth in excess of +73 dBW for A3, +70 dBW for A3H, or +64 dBW for A3A or A3J emission.

ADD *428C*

Notwithstanding the provisions of ADD 428B, broadcasting stations operating in Band 7 and notified as serving a target area partially or wholly inside the country containing the station shall in no event employ an effective radiated power in excess of 47 dBW for A3 emission, +44 dBW for A3H, or +38 dBW for A3A or A3J emission.

ADD *428D*

Broadcasting stations operating in Band 7 and serving an area as defined in ADD 428C shall not operate on a frequency above 7500 kHz.

ADD *428E*

Stations broadcasting in Band 7 shall begin to take the necessary steps to complete conversion to compatible single sideband by xx. (xx date to be subsequently determined)

ADD *428F*

Noting the provisions of No. 130 of the Convention, no Administration shall employ more than one frequency per frequency band to provide the same modulated signal simultaneously to any zone or contiguous zones.

ADD *428G*

Notwithstanding the provisions of footnote 1 to Appendix 4, no transmitter operating in the broadcasting service in Band 7 shall supply to the transmission line a mean power of any spurious emission in excess of −30 dBW.

ADD *428H*

No station shall be operated so as to cause harmful interference to another station 10 kilohertz removed.

429 through 432: Under consideration in preparation for 1978 Aero WARC.

NOC 437A, 438
NOC 439, 440
MOD 443

* * * * *

−3 kHz when two adjacent frequencies are used for single sideband radiotelephony;

−4.5 kHz when one frequency is used for single sideband radiotelephony and the adjacent frequency is used for radio telegraphy.

The use of double sideband radiotelephony in all Regions is discouraged and is to be discontinued as soon as possible and, in any event, not later than the date prescribed by these Regulations.

SUP 444

Reason: Will be overtaken by single sideband implementation.

NOC 445, 445A, 456, 457, 457A
NOC 458
NOC 463, 464
MOD 465

Administrations are urged to discontinue, in the fixed service, the use of double sideband radiotelephone transmissions. [In the bands below 30 MHz, if possible as from January 1, 1970.]

NOC 466, 467
MOD 468

To obtain economy in the use of frequencies, the International Frequency Registration Board [should] *may* be consulted by the administrations concerned whenever such agreements are under discussion on a regional or world-wide basis.

NOC 469
MOD 470

To obtain economy in the use of frequencies, the International Frequency Registration Board [should] *may* be be consulted by the administrations concerned whenever such agreements are under discussion on a regional or world-wide basis.

Reason: For consistency and to aid administrations in reaching their desired goal in their own competent, multilaterally agreed manner noting No. 128 of the Convention.

NOC 470A, 470AA, 470AB
MOD 470AC

[In the frequency bands above 15 GHz there shall be no restriction as to the direction of maximum radiation for stations in the fixed or mobile service.] *As far as practicable, sites for transmitting[3] stations, in the fixed or mobile service, employing maximum values of equivalent isotropically radiated power exceeding +45 dBW in the frequency bands between 15 and 40 GHz, should be selected so that the direction of maximum radiation of any antenna will be at least[4] [5] away from the geostationary satellite orbit, taking into account the effect of atmospheric refraction.[6]*

Reason: To provide for compatibility in the bands between 15 and 40 GHz which are now more heavily populated with that population growing.

[5]Note: Comments as to the value which would be inserted are requested.

NOC 470B, 470BA, 470C, 470CA
MOD 470DB, Spa 2

(5) The limits given in Nos. 470B and 470CA apply in the following frequency bands allocated to the fixed-satellite service for reception by space stations, where these bands are shared with equal rights with the fixed or mobile service:

27.5– 29.5 GHz
29.5– 31.0 GHz (for the country mentioned in No. 409E)
50 – 51.4 GHz
76 – 84 GHz
92 – 95 GHz
201.5–217 GHz
265 –275 GHz

NOC 470E
MOD 470J

(3A) The limits given in No. 470G apply in the following frequency bands allocated to transmission by earth stations in the fixed-satellite service and earth exploration-satellite service, and in particular the meteorological-satellite service, where these bands are shared with equal rights with the fixed or mobile service:

2 655– 2 690 MHz (Regions 2 and 3)
4 400– 4 700 MHz
5 800– 5 650 MHz (for the countries mentioned in No. 390)
[5 850– 5 925 MHz (Regions 1 and 3)]
5 925– 6 425 MHz
6 425– 6 925 MHz
7 900– 7 975 MHz
7 975– 8 025 MHz (for the countries mentioned in No. 392H)
8 025– 8 400 MHz
[10.95 –11.20 GHz (Region 1)]
12.50 –12.75 GHz (Regions 2 and 3 and for the countries mentioned in No. 405HD)

12.75 –13.25 GHz
14.175–14.300 GHz (for the countries mentioned in No. 407)
14.4 –14.5 GHz

(3B) The limits given in No. 470GA apply in the following frequency band allocated to transmission by earth stations in the fixed-satellite service, where this is shared with equal rights with the fixed or mobile service:

27.5– 29.5 GHz
80 – 84 GHz
92 – 95 GHz
201.5–217 GHz
265 –275 GHz

NOC 470K, 470V, 470VA

Article 8

GENERAL PROVISIONS

NOC 471 through 481
MOD 482

j) the technical planning for radio conferences with a view to reducing their duration *without diminishing their effectiveness;* and

NOC 483, 484
NOC 485

Reason: Simplification, and to state explicitly the implicit intent of the present provisions.

Article 10

SECTION II. PRELIMINARY EXAMINATION AND PREPARATION OF TENTATIVE HIGH FREQUENCY BROADCASTING SCHEDULE

ADD *645A*

Before the Board shall begin the work outlined in No. 646, it shall examine each notice received with respect to its conformity with the Convention, the Table of Frequency Allocations and the other provisions of the Radio Regulations including Nos. ADD 428B through ADD 428F. Further, it shall examine the Supplementary Information portion of each notice to determine whether the notifying administration has affirmed that the subject station does, in fact, comply with the provisions of No. 428G. If the Board's finding in respect to the examination of the notice to this point is in all respects entirely satisfactory, the Board shall proceed to No. 646. Otherwise, No. 645B shall apply.

ADD *645B*

If the Board's finding is unfavorable with respect to Article 7, the notice shall be returned by airmail to the notifying administration drawing attention to the Regulation or Regulations with respect to which the finding was unfavorable. If the notice is resubmitted without being sufficiently changed to enable a favorable finding in respect to Article 7, or if the notice is resubmitted with changes sufficient to enable a favorable finding in respect to Article 7 based upon the strength of the notice alone but information provided to the Board by another administration gives reason to believe the resubmitted notice may be in error, the notice shall again be returned to the notifying administration together with a reference to this Radio Regulation. A suitable entry shall be made in the Tentative High Frequency Broadcasting Schedule.

ADD 645C

If any resubmitted notice receives a satisfactory finding in respect to ADD 645A and the Board does not have in its possession such information as may in the view of the administration supplying that information give cause to believe that the resubmitted notice may be in error, the Board shall proceed to No. 646.

ADD 645D

During the period between the coming into force of the Final Acts of this conference and November, 1989, the Board shall in every case ascertain whether only single sideband emission has been notified and, if so, shall enter a suitable remark in Column B of the Tentative High Frequency Broadcasting Schedule and in Column 13C of the Master International Frequency Register. Where apparent or actual incompatibilities arise between stations using single sideband emission and other stations broadcasting in Band 7, the former shall not be required to accommodate the latter.

NOC

Article 11

NOC

INTERNAL REGULATIONS OF THE INTERNATIONAL FREQUENCY BOARD

Article 12

TECHNICAL CHARACTERISTICS OF EQUIPMENT AND EMISSIONS

NOC 667 through 675
NOC 676
NOC 677

Article 13

INTERNATIONAL MONITORING

NOC 678 through 681
MOD 682

§ 5. Administrations agree that monitoring requests from international organizations not participating in the the international monitoring system [should] *may* be co-ordinated by the Board and, if appropriate, forwarded by it to administrations.

NOC 683
MOD 684

§ 7. The technical standards recommended by the C.C.I.R. to be observed by monitoring stations shall be recognized by the Board as the optimum practicable technical standards for monitoring stations participating in the international monitoring system. [However, to meet some needs for monitoring data, stations observing lower technical standards may participate in the international monitoring system at the discretion of their administrations.]

NOC 685
SUP 688
MOD 689

§ 11. [To ensure that published monitoring data are current and world wide in nature,] administrations [having jurisdiction over monitoring stations listed in the List of International Monitoring Stations (see Article 20)] shall make every effort [, as practicable,] to arrange for monitoring observations to be [made by such stations and] submitted to the Board as soon as possible [after the date of observation.]

SUP 691
NOC 692

Article 14

INTERFERENCE AND TESTS

NOC 694 through 703

Article 15

NOC

PROCEDURE IN A CASE OF HARMFUL INTERFERENCE

(MOD) 704

It is essential that Members [and Associate Members] exercise • • •

Reason: To reflect the action of the 1973 Plenipotentiary Conference.

NOC 705 through 711A

Reason: Adequate and necessary as drafted.

MOD 711B

When cases of harmful interference occur as a result of emissions from space stations, the administrations concerned shall, upon request from the administration having jurisdiction over the station experiencing the interference, furnish current ephemeral data necessary to allow [calculation] *determination* of the positions of the space station *when not otherwise known.*

Reason: To generalize to preclude the need for calculations where not needed otherwise.

ADD *711C*

Notwithstanding any other provision of the Radio Regulations, should station(s) providing a safety service experience harmful interference irrespective of the source, that source shall immediately upon notification to the controlling administration, cease operation pending resolution of the difficulty.

NOC 712 through 717

Reason: Adequate and necessary as drafted.

MOD 718

However, the Board shall not be required to deal with problems of harmful interference between stations operating in [the same band and in conformity with the Table of Frequency Allocations when at least one of these stations is in a class the frequency of which is not required to be notified according to Nos. 486 or 487 of these Regulations; or between stations in] the band [535] *525* [1606] *1800* kHz in Region 2. Such cases of interference shall be resolved by appropriate bilateral or multilateral arrangements in which administrations should particularly observe the provisions of No. 704.

Reason: To add to the Board's effectiveness in resolving cases of harmful interference.

Article 16

NOC

REPORTS OF INFRINGEMENTS

NOC 719 through 720

Reason: Adequate and necessary as drafted.

MOD 721

If an administration has information of an infringement of the Convention or Radio Regulations, committed by a station *over* which it [has authorized] *may exercise authority,* it shall ascertain • • •

Reason: To permit action against possibly unauthorized stations committing infringements.

Article 17

SECRECY

MOD 722

Noting the provisions of Article 22 of the Convention, [The] the administrations bind themselves • • •.

NOC 723, 724

Article 18

LICENCES

NOC 725 through 727

MOD 728

The holder of a licence is required to preserve the secrecy of telecommunication, as provided in Article 22 of the Convention. Moreover, the [license] *licencing authority* shall provide specifically or by reference, * * *

Reason: To provide for those administrations who may not issue written licences.

NOC 729, 730

MOD 731

(2) For land mobile stations, *including stations comprised of only a receiver or receivers,* a clause shall be * * *.

Reason: To explicitly characterize a station noting No. 21 of these Regulations.

NOC 732 through 734.

Article 19

NOC

IDENTIFICATION OF STATIONS

MOD 735

Transmissions [without identification or with false identification are prohibited.[1]] *and transmitting stations shall be uniquely identified.[1] Administrations shall make every effort at the earliest possible time to introduce and use automatic identification. On frequencies assigned for international use, means recommended by C.C.I.R. shall be utilized.*

NOC 735.1

SUP 736, 737A

Reason: To provide universal, unique and automated identification.

NOC 738

SUP 739 through 741

Reason: Consequential to above proposals.

SUP 742

Reason: Unnecessary to incorporate Convention provisions in the Radio Regulations.

NOC

Section II. Allocation of International Series, and Assignment of Call Signs

MOD 743

[All stations open to the international public correspondence service, all amateur stations, and other stations which are capable of causing harmful interference beyond the boundaries of the country to which they belong, shall have call signs from international series allocated to each country as given in the Table of Allocation of Call Sign Series in No. 747.] *Each station whose signal could propagate internationally shall uniquely identify itself such as by a call sign formed pursuant to No. 747. Identification shall preferably be by automated means using the applicable Recommendations of the CCIR. (See Resolution G–C.)*

Reason: Consequential to above proposals.

NOC 744 through 748

Reason: Necessary and adequate as drafted.

MOD 749

Between administrative radio conferences, the Secretary General is authorized to [deal with questions relating to changes in the allocation of] *supply previously unassigned* series of call signs, on a provisional basis, * * *

Reason: For clarification.

NOC 749A through 755, 755.1, 756 through 763

Reason: Necessary and adequate as drafted.

MOD 764

However, it is recommended that, as far as possible,

a) the call signs of coast and aeronautical stations consist of:

—three letters

or

—three letters followed by [one or two] *not more than three* digits * * *

Reason: To accord with existing practice.

NOC 765 through 770

Reason: Necessary and adequate as drafted.

MOD 771

However, land mobile stations employing radiotelephony may also use a call sign consisting of:

—two, [or] three *or four* letters followed by four digits (other than the digits 0 or 1 in cases where they immediately follow a letter).

NOC 772, 773

Reason: Necessary and adequate as drafted.

MOD 773A

* * * follow a letter). [(See also No. 737A.)]

Reason: Consequential to other proposals.

NOC 774 through 781

Reason: Necessary and adequate as drafted.

NOC 782

NOC 783, 783A

Reason: Necessary and adequate as drafted.

SUP

[Formation of ship station selective call numbers and coast station identification numbers]

Reason: Superfluous.

NOC 783B through 783G

Reason: Necessary and adequate as defined.

SUP

[Assignment of ship station selective call numbers and coast station identification numbers]

Reason: Superfluous.

MOD 783H

In cases where selective call numbers for ship stations and identification numbers for coast stations are required for use in the maritime mobile service and the selective calling system is in accordance with Appendix 20C, [as an interim procedure,] the selective call numbers and identification numbers shall be supplied by the Secretary-General on request. Upon notification by an administration of the introduction of selective calling for use in the maritime mobile service:

—selective call numbers for ships will be supplied as required in blocks of 100 (one hundred);

—coast station identification numbers will be supplied in blocks of 10 (ten) to meet actual requirements;

—selective call numbers for selective calling of predetermined groups of ship stations in accordance with No. 783G will be supplied as required as single numbers.

[The final procedure shall be determined at a future competent World Administrative Radio Conference.]

Reason: To establish a satisfactory, interim procedure in ongoing form.

NOC 783I through 788

Reason: Necessary and adequate as drafted.

Article 20

SERVICE DOCUMENTS

MOD 789

The following documents shall be published by the Secretary General *This information shall be available for computer access, and, in response to individual requests, the requested information shall be available in computer printed form.*

Reason: For increased use of the information, long-term cost reduction, and to preclude interpretation that service documents shall be produced only in hard copy form.

NOC 790 through 812

Reason: Adequate as drafted.

SUP 813

Reason: Unnecessary, expensive item of limited usefulness.

NOC 814 through 829A

Reasons Acceptable as drafted.

SUP 830

Reason: Item of limited usefulness, difficult for at least some administrations to supply the sought data, and other data, such as sales of equipment, are potentially more useful for administrations' purposes.

NOC 831 through 837

Reason: Acceptable as drafted.

APPENDIX 3A

NOTE: Many of the matters treated in the balance of this Appendix presently fall beyond the scope of the draft agenda established pursuant to the 31st Session of the Administrative Council.

Article 21

MOD

INSPECTION OF [MOBILE] STATIONS [AND MOBILE EARTH STATIONS IN THE MARITIME MOBILE SATELLITE SERVICE]

MOD 838

The governments or appropriate administrations of countries which a mobile station or a mobile earth station [in the maritime mobile satellite service] visits, may require the production of the [license] *authorization* for examination. The operator of the station, or the person responsible for the station, shall facilitate this examination. The [licence] *authorization* shall be kept in such a way that it can be produced upon request. As far as possible, the [licence] *authorization*, or a copy certified by the authority which has issued it, should be permanently exhibited in the station.

Reason: To generalize the applicability, and to accommodate such situations as where a written license may not be issued.

MOD 839

The inspectors shall [have in their possession] *possess* an identity card or badge, issued by the competent authority, which [they] shall be shown on request of the master or person responsible for the ship, aircraft or other vehicle carrying the mobile station or the mobile earth station. [in the maritime mobile satellite service.]

Reason: To generalize and simplify.

MOD 840

When the [licence] *authorization* cannot be produced or when [manifest] irregularities * * *

Reason: As above, and to prevent confusion.

NOC 841

Reason: Necessary and adequate as drafted.

MOD 842

* * * the mobile station or mobile earth station [in the maritime mobile satellite service] is subject * * *

Reason: To generalize.

* * * or other vehicle carrying the mobile station or mobile earth station [in the maritime mobile satellite service]. If any breach * * *

Reason: To generalize.

MOD 844
The Members of the Union [undertake not to] *shall not* impose upon foreign mobile stations or upon foreign mobile earth stations [in the maritime mobile satellite service] which are temporarily within their territorial waters or make a temporary stay in their territory, technical and operating conditions more severe than those contemplated in these Regulations. This [undertaking] *provision* in no way affects arrangements which are made under international agreements relating to [maritime or air navigation,] *mobile or mobile earth stations*, and which are therefore not covered by these Regulations.

Reason: To generalize and to tighten the constraint upon Members not to exceed these Regulations.

NOC

Chapter VI

MOD
Personnel of Stations [in the Mobile Service and the Maritime Mobile Satellite Service]

NOC

Article 22

MOD
Authority of the [Master] *Captain*

MOD 845
The service of a mobile station is placed under the supreme authority of the [master] *captain* or of the person responsible • • •

Reason: To generalize and to reflect the applicability of these provisions to all mobile stations.

NOC 846

MOD 847
The [master] *captain* • • •

Reason: As above.

MOD 847A
The authority and obligations imposed by Nos. 845, 846 and 847 shall also apply to personnel of mobile earth stations in the [maritime] mobile-satellite service.

Reason: To generalize.

Article 23

NOC
OPERATORS' CERTIFICATES FOR SHIP AND AIRCRAFT STATIONS AND MOBILE EARTH STATIONS IN THE MARITIME MOBILE SATELLITE SERVICE

NOC
Section I. General Provisions

NOC 848, 849, 849A, 850, 850.1, 851

Reason: Necessary and adequate as drafted.

MOD 852
The provisions of No. 851 shall not [, however,] apply to any ship or aircraft station working on frequencies assigned for international use, *and which operate on ships or aircraft engaged in international voyages or flights. Further, administrations may, by bilateral agreements, apply No. 851 to stations on ships or aircrafts engaged in voyages or flights solely between the countries involved*

Reason: To afford each administration the latitude needed.

MOD 853
In the case of complete unavailability of the operator in the course of a sea passage, a flight or a journey, and solely as a temporary measure, the [master] *captain* or the person responsible for the station may authorize an operator holding a certificate issued by the government of another Member of Union to perform the radiocommunication service.

Reason: To reflect the general applicability of this provision to all mobile stations.

NOC 854

(MOD) 855
In all cases, such temporary operators must be replaced as soon as possible by operators holding the certificate prescribed in [§ 1 of] this Article.

Reason: To afford editorial simplification.

MOD 856, 856A
Each administration shall take the necessary steps to prevent, to the maximum extent possible, the fraudulent use of certificates. For this purpose, such certificates shall bear the holder's signature and shall be authenticated by the issuing administration. [Administrations may employ, if they wish, other means of identification such as photographs, fingerprints, etc. However, in the maritime mobile service the] *Certificates* [issued after 1 January 1978] may bear [the] *a* photograph of the holder, *which the administration shall verify is recent*, and the holder's date of birth.

Reason: To update and simplify these provisions while reducing still further the likelihood of fraudulent usage.

NOC 857

Reason: Adequate and necessary as drafted.

MOD 857A
However, in [the maritime] mobile *and mobile-satellite* services all certificates not in one of the working languages of the Union [and issued after 1 January 1978] shall carry at least the following information in one of these working languages:

—the name and date of birth of the holder,
—the title of the certificate and its date of issue,
—if applicable, the number and period of validity of the certificate,
—the issuing administration.

Reason: To generalize applicability.

NOC 858

Reason: Adequate and necessary as drafted.

NOC

Section II. Classes and Categories of Certificates except for the Operators of Ship Stations

MOD 859
There are two classes of certificates, *a radiocommunication operator's general certificate and a radiotelegraph operator's certificate*[1] [as well as a special certificate, for radiotelegraph operators.[1]]

Reason: For simplification.

MOD 860
There are two categories of radiotelephone operators' certificates, general and, *should an administration desire*, restricted.[1] *There is also a radiocommunication operator's general certificate for the aeronautical and maritime mobile services*

NOC 861, 862

Reason: Adequate as drafted.

MOD 863
The holder of a radiotelephone operator's restricted certificate may carry out the radiotelephone service of any aircraft station, [when working on frequencies of the maritime mobile service,] provided that:

• • • • •

Reason: To generalise.

NOC 864, 865, 866

Reason: Adequate as drafted.

MOD 866A
There are [four] 2 categories of certificates for radiotelegraph operators,[1] namely:

—the radiocommunication operator's general certificate,
[—the first class radiotelegraph operator's certificate,
—the second class radiotelegraph operator's certificate,]
—the radiotelegraph operator's special certificate.

MOD 866B
There are two categories of radiotelephone operator's[2] certificates, general and, *should an administration desire*, restricted.

Reason: Simplification.

MOD 866C
The holder of a radiocommunication operator's general certificate[, or of a first class or second class radiotelegraph operator's certificate,] may carry out the radiotelegraph or radiotelephone service of any ship station.

Reason: Consequential amendment.

NOC 866D

Reason: Adequate as drafted.

(MOD) 866E
• • • transmitter does not exceed [1,5] *1.5* kilowatt.

Reason: To accord with normal English language usage.

NOC 866F through 866I

Reason: Adequate as drafted.

SUP 867

Reason: Redundant. Continuation of this provision does not serve a useful purpose.

NOC 868 through 869

Reason: Necessary and adequate as drafted.

NOC 870

Reason: Adequate as drafted.

MOD 870A
However, [with respect to the maritime mobile service,] administrations should also take whatever steps they consider necessary to ensure the continued proficiency of operators while in service.

Reason: For generality. The provision, as written, was adopted by a specialised maritime conference thus necessitating the restriction of this provision's applicability.

NOC 870B through 870K

Reason: Necessary and adequate as drafted.

SUP through 888
[B. First Class Radiotelegraph Operator's Certificate]

Reason: To reduce the number of classes to the general and special certificates to better future needs.

NOC 889 through 893

Reason: Adequate as drafted.

MOD 895A
• • • ship station operators. [after 1 January 1976.]

Reason: Overtaken by events.

NOC 894 through 896

Reason: Necessary and adequate as drafted.

MOD 899
The restricted radiotelephone operator's certificate [is] *may be* issued to candidates who have given proof of the knowledge and professional qualifications enumerated below:

Reason: To save for administrations the option of whether the restricted certificate is to be issued.

NOC 900

Reason: Necessary and adequate as drafted.

MOD 901
Ability *in at least one working language of the Union* to send correctly and to receive correctly by telephone.

Reason: To facilitate intercommunication by radiotelephony such as where the safety of life or property may be involved.

NOC 902

Reason: Necessary and adequate as drafted.

MOD 903

• • • each administration may itself fix the conditions for obtaining a restricted radiotelephone operator's certificate *if same are issued by that administration*, provided • • •

Reason: To preclude the implication that an administration must issue restricted certificates. See MOD 899.

MOD 904

Administrations [in Region 1 do] *need* not issue certificates under No. MOD 903[.] *depending on national desires.*

Reason: Consequential amendment.

NOC 905, 905A, 906

Reason: Necessary and adequate as drafted.

MOD 907, 907A and 908

• • • general certificate [or a first- or second-class radiotelegraph operator's certificate] • • •

Reason: Consequential amendment.

MOD 909

• • •general certificate [or a first-class radiotelegraph operator's certificate] • • •

Reason: Consequential amendment.

Article 24

CLASS AND MINIMUM NUMBER OF OPERATORS FOR STATIONS ON BOARD SHIPS AND AIRCRAFT

SUP 912

Reason: Superfluous. Other considerations will ensure that administrations will have sufficient personnel on hand to handle public correspondence.

Article 29

GENERAL RADIOTELEGRAPH PROCEDURE IN THE MARITIME MOBILE [AND AERONAUTICAL MOBILE] SERVICE[S]

MOD 1000

§ 1. (1) In the maritime mobile [and aeronautical mobile] service[s] the procedure detailed in this Article is obligatory, except in cases of distress, urgency or safety, to which the provisions of Article 36 are applicable.

SUP 1001

SUP 1002

MOD 1003

§ 2. The use of the Morse code signals specified in the Telegraph Regulations*) shall be obligatory in the maritime [and aeronautical] mobile service[s]. However, for radiocommunications of a special character, the use of other signals is not precluded.

SUP 1004

MOD 1005 Mar

(2) In the maritime mobile service, [only] the service abbreviations given in Appendix 13A are to be used.

NOC 1007

NOC 1008

NOC 1010

NOC 1011

MOD 1009

a) The mobile station whose emission causes interference to the correspondence of a mobile station with a coast [or aeronautical] station, shall cease sending at the first request of the coast [or aeronautical] station.

MOD 1012

§ 6. (1) The *Morse* call consists of:

—The call sign of the station called, not more than three times;

—the word DE;

—the call sign of the calling station, not more than three times.

SUP 1013

SUP 1013A

SUP 1013AA

SUP 1013AB

NOC 1013B Mar2

NOC 1013C Mar2

NOC 1014

SUP 1015

MOD 1015A Mar2

(3) [However,] when using direct-printing telegraphy or similar systems in any of the frequency bands allocated to the maritime mobile service, the call may, by prior arrangement, be made on a working frequency available for such systems.

SUP 1016 Mar2

MOD 1016A Mar2

(1A) [In the maritime mobile service,] the call, as described in No. 1013B Mar 2, shall contain the service abbreviation indicating the working frequency and, if useful, the class of emission which the calling station proposes to use for the transmission of its traffic.

SUP 1017

SUP 1018

SUP 1019

SUP 1019A

SUP 1020

MOD 1020A Mar2

(1A) [In the maritime mobile service] the calling station shall transmit the service abbreviation after the above-mentioned preparatory signals to indicate a priority message other than a distress, urgency or safety message (see No. 1496A) and to indicate the reason for the call.

NOC 1021

SUP 1022

MOD 1022A Mar2

§ 10A. [In the maritime mobile service] the reply to calls consists of:

—the call sign of the calling station, not more than twice;

—the word DE;

—the call sign of the station called, once only.

SUP 1023 through 1040

SUP 1041

SUP 1042

NOC 1043

NOC 1044

NOC 1045

NOC 1047

MOD 1046

§ 16. (1) As a general rule, radiotelegraphs of all kinds transmitted by ship stations [and radiotelegrams in the public correspondence service transmitted by aircraft stations,] shall be numbered in a daily series; number 1 shall be given to the first radiotelegram sent each day to each separate station.

MOD 1048

§ 17. (1) [In cases where both stations are able to change from sending to receiving without manual switching, the transmitting station may continue to send until completion of the message or until the receiving station breaks in on the transmission with the service abbreviation BK. Before commencing, both stations normally agree on such a method of working by means of the abbreviations QSK.] *Unless operations are agreed to by means of the abbreviations QSK and BK, long radiograms shall be transmitted in sections. Each section shall contain no more than 50 words in the case of plain language and no more than 20 words or otherwise.*

SUP 1049

NOC 1050

SUP 1051

NOC 1052

NOC 1053

NOC 1054

MOD 1055

(2) The acknowledgment of receipt shall be transmitted by the receiving station on the traffic frequency [(see Nos. 1041 and 1042)].

NOC 1056

MOD 1057

(2) The signal . . . — . — (end of work) shall also be used[:]

[X] when the transmission of radiotelegrams of general information, meteorological information and general safety notices is finished, [and]

[X] When transmission is ended in long distance radiocommunication services with deferred acknowledgment of receipt or without acknowledgment of receipt.]

SUP 1058

NOC 1059

NOC 1060

MOD 1061

§ 25. When it is necessary for a mobile station to send signals for testing or adjustment which are liable to interfere with the working of [neighbouring coast or aeronautical] *another* station[s], the consent of [these] *this* station[s] shall be obtained before such signals are sent.

NOC 1062

NOC 1062AA

NOC 1062AB

NOC 1062AC

NOC 1062AD

NOC 1062AE

NOC 1062AF

NOC 1062AG

NOC 1062AH

NOC 1062AI through 1062BH

Article 30

CALLS BY RADIOTELEGRAPHY

NOC 1063 through 1067A

MOD 1068

(2) Continuous or frequently repeated emissions of its call sign or the enquiry signal CQ by coast station [should] *shall* be avoided (see No. 693). *In particular CQ shall not be used for more than 5 consecutive minutes in any half hour.*

NOC 1068A through 1087

Article 31

RADIOTELEGRAPHIC CALL TO SEVERAL STATIONS

NOC 1087A through 1094

Article 32

USE OF FREQUENCIES FOR RADIOTELEGRAPHY IN THE MARITIME MOBILE AND AERONAUTICAL MOBILE SERVICES

NOC 1094A through 1107

MOD 1108

(2) However, ship and aircraft stations which cannot transmit on 500 kHz [should] *may* use any other available frequency on which attention might be attracted.

NOC 1109 through 1149, 1159 through 1164, 1165 through 1972, 1176A, 1176B, 1177, 1177.1, 1177A.

MOD 1177B

§ 30B. If it is not intended to maintain watch on all the receiving channels within a group, the administration concerned, in order to ensure an even distribution of calls, shall determine the channel or channels on which watch will be maintained but only after coordination [as far as possible] has been undertaken with administrations sharing the same group (see Resolution No. Mar 2-5).

NOC 1177C, 1177D

SUP 1177E

MOC 1178 through 1179, 1189 through 1191, 1191B, 1191C, 1191DA, 1200, 1200A, 1203, 1204, 1204A
SUP 1207, 1208

Article 35

USE OF FREQUENCIES FOR RADIOTELEPHONY IN THE MARITIME MOBILE SERVICE

SUP 1319
MOD 1320
(2) Aircraft stations may enter into *radio* telephone communication with stations of the maritime mobile service on frequencies allocated to that service for radiotelephony. They shall comply with the provisions of this Article and Article 27.

NOC 1321 through 1322AB
NOC 1322C
NOC 1322D
NOC 1323A
NOC 1324 through 1336
NOC 1338 through 1340
NOC 1343 through 1351
NOC 1351B
NOC 1351E
NOC 1351F
NOC 1351G
NOC 1351H
NOC 1352AA
NOC 1353B
NOC 1354
NOC 1354A
MOD 1354B
(2) These stations [should] *shall* maintain this watch by means of an operator using some aural method, such as headphones, split headphone or loudspeaker.

MOD 1355
§ 17. (1) For the conduct of duplex telephony, the transmitting frequencies of the coast stations and of the corresponding ship stations shall be associated in pairs, as indicated in Appendix 17 and Appendix 17 Rev., except temporarily *on the coast station frequency in accordance with No. 418* in cases where working conditions prohibit the use of paired frequencies in order to meet operational needs.
Reason: To improve duplex telephony's circumstances.
NOC 1356, 1357, 1359, 1359A, 1359B, 1361, 1362, 1363
MOD 1363A
(6) Before transmitting on the frequency 156.8 MHz, a station in the mobile service should listen on this frequency [for a reasonable period] to make sure that no distress traffic is being sent (see No. 1217).
NOC 1363B
NOC 1363C
MOD 1364
§ 19. (1) A coast station providing an international maritime mobile radiotelephone service in the band 156–174 MHz and which forms an essential part of the coverage of the area for distress purposes [should] *shall* during its working hours in that band, maintain an [efficient] aural watch on 156.8 MHz (see Recommendation No. Mar2–10).
NOC 1365 through 1366
MOD 1367
(4) Ship stations should, where practicable, maintain watch on 156.8 MHz when within the service area of a coast station providing international maritime mobile radiotelephone service in the band 156–174 MHz. Ship stations fitted only with VHF radiotelephone equipment operating in the authorised bands between 156 and 174 MHz, [should] *shall* maintain watch on 156.8 MHz, when at sea.
NOC 1367A, 1367B, 1368, 1368A
MOD 1369
§ 21. (1) [Where practicable], coast stations open to the international public correspondence service shall be capable of working with ship stations equipped for duplex or semi-duplex operation.
NOC 1370, 1371, 1371A, 1372
MOD 1373
(2) In the band 156 to 174 MHz administrations shall[, where practicable,] assign frequencies to coast and ship stations in accordance with the Table of Transmitting Frequencies given in Appendix 18 for such international services as administrations consider necessary (see Resolution No. Mar2–14).
NOC 1373A, 1374, 1375
SUP 1376
NOC 1377
MOD

Article 35A

CONDITIONS TO BE OBSERVED BY MOBILE EARTH STATIONS IN THE MARITIME MOBILE-SATELLITE SERVICE

NOC 1379AA
Reason: Necessary and adequate as drafted.
MOD 1379AB
The frequencies of emissions of mobile earth stations shall be checked [as often as practicable] *at least annually* by the inspection service to which these stations are subject.
Reason: To insure at least annual checks.
MOD 1379AC
The energy radiated by receiving apparatus [shall be reduced to the lowest practicable value and] shall not cause harmful interference to other stations.
Reason: The expression "lowest practicable value" is not quantified.
MOD 1379AD
Administrations shall [take all practicable steps necessary to] ensure that the operation of any electrical or electronic apparatus installed in mobile earth stations does not cause harmful interference to the [essential] radio services of stations which are operating in accordance with the provisions of these Regulations.
Reason: To preclude interpretations which might negate the effect this provision as drafted would otherwise have.

Article 36

DISTRESS SIGNAL AND TRAFFIC, ALARM, URGENCY AND SAFETY SIGNALS

NOC 1380 through 1464
MOD 1465
§ 40. (1) The radiotelephone alarm signal consists of two [substantially] sinusoidal audio frequency tones transmitted alternately. One tone shall have a frequency of 2 200 Hz and the other a frequency of 1 300 Hz, the duration of each tone being 250 milliseconds.
NOC 1466 through 1476
MOD 1476AA
§ 44AA. (1) The navigational warning signal consists of one [substantially] sinusoidal tone of the frequency 2 200 Hz, interrupted so that the durations of tone and space are 250 milliseconds each.
NOC 1476AB through 1495
SUP

Article 37

RADIOTELEGRAMS, RADIOTELEPHONE CALLS AND RADIOTELEX CALLS

MOD

Article 37A

ORDER OF PRIORITY OF COMMUNICATIONS IN THE [MARITIME] MOBILE SERVICE AND IN THE [MARITIME] MOBILE-SATELLITE SERVICE

NOC 1496A

Article 38

INDICATION OF THE STATION OF ORIGIN OF RADIOTELEGRAMS

NOC 1497 through 1499

Article 39

ROUTING OF RADIOTELEGRAMS

NOC 1500 through 1501
SUP 1502
MOD 1503
§ 3. If the sender of a radiotelegram handed in at a mobile station has indicated the coast or aeronautical station to which he desires his radiotelegram to be sent, the mobile station shall, in order to effect this transmission to the coast or aeronautical station indicated, wait, if necessary, until the conditions specified in Nos. 1500 to [1502] *1501* above are fulfilled.
NOC 1504
NOC

Article 41

AMATEUR STATIONS

Reason: Sufficient as drafted.
MOD

Article 42

EXPERIMENTAL STATIONS

NOC 1568 through 1572
Reason: Adequate as drafted.
MOD 1573
All the general rules of the Convention, and of these Regulations, shall apply to experimental stations. In particular, experimental stations shall comply with the technical conditions imposed upon transmitters operating in the same frequency bands, [except where the technical principles of the experiments prevent this.] *unless an appropriate waiver is secured from the administration concerned.*
Reason: To clarify that the decision as to when departure from otherwise applicable technical conditions rests with the administration concerned as opposed to the operator(s) of the experimental station(s).
NOC 1574, 1575
Reason: Adequate as drafted.
MOD

Article 43

NOC

RADIODETERMINATION SERVICE AND RADIODETERMINATION-SATELLITE SERVICE

MOD 1576
Administrations which have established a radiodetermination service shall take the necessary steps to ensure the effectiveness and regularity of that service [;. however they accept no responsibility for the consequences that might arise from the use of inaccurate information furnished, defective working, or failure of their stations].
Reason: To preclude internal inconsistency and for clarity.
NOC 1577 through 1583
Reason: Adequate as drafted.
SUP 1584
Reason: Superfluous. Radiocommunication by radiotelephony or radiotelegraphy is presumed to be subject to the provisions of these Regulations unless a specific proviso otherwise stipulates.

(MOD) 1584A
"• • • [1584] *1583* • • •"
Reason: Consequential.
NOC 1585 through 1595
Reason: Necessary and adequate as drafted.
MOD

Article 44

NOC

SPECIAL SERVICES

NOC 1596 through 1614
Reason: Necessary and adequate as drafted.
MOD 1615
Messages originating in mobile stations and containing information concerning the presence of cyclones shall be transmitted[, with the least possible delay,] *immediately* to other mobile stations • • •
Reason: Any delay in the transmission of advice in respect to a possibly nearby cyclone may prove catastrophic.
NOC 1616 through 1622
Reason: Necessary and adequate as drafted.
MOD 1623
To facilitate more efficient use of the radio frequency spectrum and to assist other technical and scientific activities, administrations should [endeavour to] provide, on a co-ordinated world-wide basis, a service of standard frequency and time signal transmissions. Attention should be given to the extension of this service to those areas of the world not adequately served.
Reason: To strengthen this provision, noting its purpose together with the fact that it is not proposed that the word "should" be modified.
NOC 1624 through 1628
Reason: Adequate as drafted.

NOC

Appendix 6

Reports of Monitoring Data

Reason: Necessary and adequate as drafted.

NOC

Appendix 7

Report of an Irregularity or of an Infringement on the Convention or the Radio Regulations

Reason: Necessary and adequate as drafted.

NOC

Appendix 8

Report of Harmful Interference

Reason: Necessary and adequate as drafted.

MOD

Appendix 9

Service Documents (See Article 20 MOD)

NOC
List I, List II

Reason: Continued possible need for hard copy version.

SUP
List III A.

Reason: Same information is available from IFL. Electronic facilities would enable selecting IFL-entered data as desired. Finally, List III A is bulky, expensive, little-used and is not sold at a profit to administrations thus forcing other administrations to subsidize this List.

SUP
List III A.

Reason: Same information is available from IFL when updated, from current, applicable Tentative High Frequency Broadcasting Schedule, from High Frequency Broadcasting Schedule for past season in question, or from recapitulative Annual High Frequency Broadcasting Frequency List issued per Radio Regulation No. 655.

NOC
List IV, V, VI, VII.

Reason: Continued possible need for hard copy version.

MOD
List VIII A: It is proposed that this List be among those made available in micro form

Reason: To enhance utilizability.

ADD

Resolution G–C

Relating to Automatic Identification

The General World Administrative Radio Conference, Geneva, 1979, considering

a) the state of the art in respect to identification
b) the need for unique identification
c) the possibility of inadvertent operator error
d) the ever increasing number of active transmitters not only within existing administrations but also noting the ongoing asignments of new call sign and selective calling series
e) the economics of presently available equipment which is directly applicable to automatic identification
f) the possibilities for use of automatic, faster message transmission service in conjunction with automatic identification equipment
g) the increased ease of resolving cases of harmful interference and of ensuring compliance with the provisions of the Convention and the Radio Regulations

resolves
1. that administrations shall implement automatic identification as provided in Article 19 MOD at the earliest possible time, and
2. that automatic means of identification should be adopted by all administrations.

requests the CCIR
to develop and recommend the technical parameters and operational aspects needed, in sufficient time utilizing, as necessary, Interim Working Parties

instructs the Secretary General
to make a special effort to keep all administrations advised on a regular basis of any related development including those having direct application to automatic identification.

APPENDIX 4. PROPOSAL FOR RESOLUTIONS AND RECOMMENDATIONS

Resolutions

Resolution 1—SUP
Reason: This Resolution is no longer applicable
Resolution 2—SUP
Reason: This Resolution has been overtaken by events and is no longer applicable
Resolution 3—SUP
Reason: This Resolution has been overtaken by events and is no longer applicable; see narrative par. 203
Resolution 4—SUP
Reason: By 1979, This Resolution will have been overtaken by events and will no longer be applicable
Resolution 10—
Reason: Reviewed; see narrative par. 204
Resolution 11—SUP
Reason: This Resolution has been overtaken by events and is no longer applicable
Resolution 13—SUP
Reason: should be overtaken by events as result of 1978 AWARC
Resolution 14—SUP
Reason: Replace with ADD Resolution Aer 2–(C) as stated in proposals for 1978 AWARC FCC Docket No. 20290
Resolution 15—
Reason.: Reviewed; no action proposed
Resolution Aer 1—SUP
Reason: Replace with ADD Resolution Aer 2–(D) as stated in proposals for 1978 AWARC FCC Docket No. 20290
Resolution Aer 2—SUP
Reason: Replace with ADD Resolution Aer 2–(E) as stated in proposals for 1978 AWARC FCC Docket No. 20290
Resolution Aer 3—SUP
Reason: Should be overtaken by events as result of 1978 AWARC
Resolution Aer 4—SUP
Reason: Replace with ADD Resolution Aer 2–(F) as stated in proposals for 1978 AWARC FCC Docket No. 20290
Resolution Aer 5—SUP
Reason: Replace with ADD Resolution Aer 2–(G) as stated in proposals for 1978 AWARC FCC Docket No. 20290
Resolution Aer 6—SUP
Reason: Replace with ADD Resolution Aer 2–(H) as stated in proposals for 1978 AWARC FCC Docket No. 20290
Resolution Mar 3—
Reason: Abrogated by Resolution Mar 2–1
Resolution Mar 4—SUP
Reason: By 1979, this Resolution will have been overtaken by events and will no longer be applicable
Resolution Mar 5—
Reason: Reviewed; see narrative par. 205
Resolution Mar 6—
Reason: Abrogated by Resolution Mar 2–1
Resolution Mar 7—NOC
Reason: This Resolution is still applicable
Resolution Mar 8—
Reason: Abrogated by Resolution Mar 2–1
Resolution Mar 9
Reason: Abrogated by Resolution Mar 2–1
Resolution Mar 10
Reason: Abrogated by Resolution Mar 2–1
Resolution Mar 11—SUP
Reason: This Resolution has been overtaken by events and is no longer applicable
Resolution Mar 12
Reason: Abrogated by Resolution Mar 2–1
Resolution Mar 13
Reason: Abrogated by Resolution Mar 2–1
Resolution Mar 14
Reason: Abrogated by Resolution Mar 2–1
Resolution Mar 15—SUP
Reason: This Resolution has been overtaken by events and is no longer applicable
Resolution Mar 16
Reason: Abrogated by Resolution Mar 2–1

Resolution Mar 18
Reason: Abrogated by Resolution Mar 2-1
Resolution Spa 2-3—NOC
Reason: This Resolution is still applicable
Resolution Spa 2-5
Reason: Abrogated by Resolution Mar 2-1
Resolution Mar 2-2—SUP
Reason: By 1979, the necessary actions will have been completed, and this Resolution will no longer be applicable
Resolution Mar 2-3—SUP
Reason: By 1979, the necessary actions will have been completed, and this Resolution will no longer be applicable
Resolution Mar 2-4—SUP
will have been completed, and this Resolution will no longer be applicable
Resolution Mar 2-5—SUP
Reason: By 1979, the necessary actions should have been completed, and this Resolution should no longer be applicable; see narrative par. 206
Resolution Mar 2-6—SUP
Reason: By 1979, the necessary actions will have been completed, and this Resolution will no longer be applicable
Resolution Mar 2-7—NOC
Reason: Since there will not have been enough experience by 1979 with the type of operation, a future Maritime WARC should complete the actions envisioned by this Resolution
Resolution Mar 2-8—NOC
Reason: Since there will not have been enough experience by 1979 with the type of operation, a future Maritime WARC should complete the actions envisioned by this Resolution
Resolution Mar 2-9—SUP
Reason: By 1979, the necessary actions will have been completed, and this Resolution will no longer be applicable
Resolution Mar 2-10—SUP
Reason: By 1979, the necessary actions will have been completed, and this Resolution will no longer be applicable
Resolution Mar 2-11—SUP
Reason: By 1979, the necessary actions will have been completed, and this Resolution will no longer be applicable
Resolution Mar 2-12—SUP
Reason: By 1979, the necessary actions will have been completed, and this Resolution will no longer been applicable
Resolution Mar 2-13—SUP
Reason: By 1979, the necessary actions will have been completed, and this Resolution will no longer be applicable
Resolution Mar 2-14—NOC
Reason: This Resolution is still applicable. It deals with the narrowing of VHF channel spacing and the associated transition schedule; the U.S. has been generally ahead of the stated schedule.
Resolution Mar 2-15—NOC
Reason: This Resolution is still applicable
Resolution Mar 2-20—
Reason: Reviewed; see narrative par. 205
Resolution Mar 2-21—NOC
Reason: This Resolution is still applicable

Recommendations

Recommendation 10—NOC
Reason: This Recommendation is still applicable
Recommendation 11—NOC
Reason: This Recommendation is still applicable
Recommendation 14
Reason: Reviewed; no action proposed
Recommendation 15
Reason: Reviewed; no action proposed
Recommendation 20—NOC
Reason: This Recommendation is still applicable; there is still an obligation to provide for an aviation collision avoidance system
Recommendation 21
Reason: Reviewed; no action proposed
Recommendation 22
Reason: Abrogated by Resolution Mar 1
Recommendation 23
Reason: Abrogated by Resolution Mar 1
Recommendation 24
Reason: Abrogated by Resolution Mar 1
Recommendation 25
Reason: Abrogated by Resolution Mar 1
Recommendation 26
Reason: Abrogated by Resolution Mar 1
Recommendation 27
Reason: Abrogated by Resolution Mar 1
Recommendation 28
Reason: Abrogated by Resolution Mar 1
Recommendation 30
Reason: Abrogated by Resolution Mar 1
Recommendation 31—NOC
Reason: This Recommendation is still applicable; see narrative par. 207
Recommendation 32—SUP
Reason: This Recommendation has been overtake by events and is no longer applicable
Recommendation 33
Reason: Reviewed; no action proposed
Recommendation 36
Reason: Abrogated by Resolution Spa 2-8
Recommendation 37—SUP
Reason: This Recommendation has been overtaken by events and is no longer applicable; see narrative par. 203
Recommendation Spa 1
Reason: Abrogated by Resolution Spa 2-8
Recommendation Spa 2
Reason: Abrogated by Resolution Spa 2-8
Recommendation Spa 3
Reason: Abrogated by Resolution Spa 2-8

Recommendation Spa 5—MOD

RECOMMENDATION NO. SPA 5

to the C.C.I.R. Relating to the Broadcasting-Satellite Service

The Extraordinary Administrative Radio Conference, Geneva, 1963, considering

a) that the use of satellite transmissions for direct reception by the general public of sound and television broadcasts may be possible in the future;

b) that the C.C.I.R. is studying the technical feasibility of sound and television broadcasting from satellites, the technically suitable frequency bands for such a service, including the possibility of sharing with terrestrial services;

recommends

that the C.C.I.R. expedite its studies and make early recommendations on Question [241 (IV),] *5-2/11* Geneva, [1963] *1974*, in particular, regarding those parts of the question relating to the technical feasibility of broadcasting from satellites, the optimum technical characteristics of the systems to be used, what bands would be technically suitable and whether and under what conditions those bands could be shared between the broadcasting-satellite and terrestrial services.

Reason: This Recommendation is modified in order to make it current.
Recommendation Spa 6
Reason: Abrogated by Resolution Spa 2-8
Recommendation Spa 7
Reason: Reviewed; no action proposed
Recommendation Spa 8—NOC
Reason: This Recommendation is still applicable
Recommendation Spa 11—NOC
Reason: This Recommendation is still applicable
Recommendation Aer 1—SUP
Reason: Replace with ADD Recommendation Aer 2-(B) as stated in proposals for 1978 AWARC FCC Docket No. 20290
Recommendation Mar 1
Reason: Abrogated by Resolution Mar 2-1
Recommendation Mar 4
Reason: Abrogated by Resolution Mar 2-1
Recommendation Mar 5
Reason: Reviewed; no action proposed
Recommendation Mar 6—SUP
Reason: By 1979, this Recommendation will have been overtaken by events and will no longer be applicable
Recommendation Mar 7
Reason: Abrogated by Resolution Mar 2-1
Recommendation Mar 8
Reason: Abrogated by Resolution Mar 2-1
Recommendation Mar 2-1
Reason: Reviewed; see narrative par. 208
Recommendation Mar 2-2—SUP
Reason: The concept of separation of calling channels from distress channels is not appropriate (Draft CCIR SG6 report supports this reason)
Recommendation Mar 2-3—SUP
Reason: The need for common channels to avoid new crystallization of equipment for international voyages will diminish with the increased use of sythesizers
Recommendation Mar 2-7—NOC
Reason: This Recommendation is still applicable
Recommendation Mar 2-8—NOC
Reason: This Recommendation is still applicable; see narrative par. 209
Recommendation Mar 2-9
Reason: Reviewed; see narrative par. 209
Recommendation Mar 2-11
Reason: Reviewed; see narrative par. 210
Recommendation Spa 2-1
Reason: Reviewed; see narrative par. 211
Recommendation Spa 2-3
Reason: Reviewed; see narrative par. 212
Recommendation Spa 2-4
Reason: Reviewed; see narrative par. 212
Recommendation Spa 2-5
Reason: Reviewed; see narrative par. 212
Recommendation Spa 2-6
Reason: Reviewed; no action proposed
Recommendation Spa 2-7
Reason: Reviewed; see narrative par. 213

APPENDIX 5.—EVALUATION OF THE IMPACT OF PROPOSED FIXED SATELLITE ALLOCATIONS

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5.2 Frequency Assignment Distribution for the 5.6–5.925 GHz Bands.
6.1 Equipment Characteristics.

SECTION 1. INTRODUCTION

1.1 *Background.* Projections in growth of civilian use of the satellite service is expected to increase by a factor of 8 within the next 25 years. Some of the expansion may be absorbed by using the 12/14 GHz and 17.7/27.5 GHz frequency bands. However, due to economic considerations associated with maximum utilization of existing hardware, use of the spectrum below 10 GHz is highly desirable. The bands presently used by INTELSAT are: uplink of 5.925–6.425 GHz and downlink of 3.7–4.2 GHz. Internationally, the following bands are also allocated worldwide for the Fixed Satellite service: 3.4–3.7 GHz (downlink) and 4.4–4.7 GHz (uplink). In Region 1, the band 5.725–5.925 GHz and in Region 3, the band 5.850–5.925 GHz are allocated to the fixed satellite service. The present fixed satellite international allocations and a system summary for all the bands between 2.5–10.0 GHz are provided in table 1.1. Nationally the 3.3–3.7 GHz, 4.4–4.9 GHz and 5.65–5.925 GHz bands are allocated to the Government on a primary basis for: radiolocation, aeronautical radionavigation and fixed and mobile. The government is projecting a steady growth in the use of all three bands over the next twenty years.

The Third Notice of Inquiry (3rd NOI) suggested the following additional bands for the non-Government fixed satellite service: 4.7–4.9 GHz, 5.625–5.925 GHz and 6.425–6.925 GHz. As mentioned above, the first two bands are allocated to the Government on a primary basis. The 4.4–4.9 GHz frequency band is allocated to the fixed and mobile services and the 5.650–5.925 GHz frequency band is allocated to the radiolocation service.

The fixed satellite service frequency pairing resulting from the allocation suggested in the 3rd NOI would be:

(a) 5.625–5.925 GHz (uplink) and 3.4–3.7 GHz (downlink). Effectively, this would allow these bands to be paired with existing fixed satellite bands so that the combined bands would be 5.625–6.425 GHz (uplink) and 3.4–4.2 GHz (downlink).

(b) 6.425–6.925 GHz (uplink) and 4.4–4.9 GHz (downlink). As shown, these proposed allocations would benefit the non-Government fixed satellite service at the expense of loss of spectrum to the Government users or at least limitations on the current access to the present spectrum space. Thus, 2.6 GHz or 26% of the spectrum below 10 GHz would be available to non-Government fixed satellite use. The Office of Telecommunications Policy (OTP) considers this problem to be one of the major issues confronting current WARC deliberations in view of the national economic and operational considerations involved.

TABLE 1.1

Present Fixed Satellite International Allocations and Usage in the Bands Between 2.5 and 10.0 GHz

FREQUENCY BAND, GHZ	REGIONS	LINK	PRESENT SYSTEMS
2.5-2.535	2,3	dwn	NONE KNOWN
2.655-2.69	2,3	up	ATS.6 (experimental TV down link)
3.4-3.5	1,2,3	dwn	MOLNIA, STATSIONAR
3.5-3.7	1,2,3	dwn	MOLNIA, STATSIONAR
3.7-4.2	1,2,3	dwn	ATS,6, ANIK, COMSTAR, INTELSAT MARISAT, MOLNIA, MOLNIYA, PALAPA, SATCOM, STATSIONAR, SYMPHONIE, WESTAR
4.4-4.7	1,2,3	up	NONE KNOWN
5.725-5.85	1	up	MOLNIA, STATSIONAR
5.85-5.925	1,3	up	MOLNIA, STATSIONAR
5.925-6.425	1,2,3	up	ATS-6, ANIK, COMSTAR, INTELSAT, MARISAT, MOLNIA, MOLNIYA, PALAPA, SATCOM, STATSIONAR, SYMPHONIE, WESTAR
7.25-7.75	1,2,3	dwn	DSCS, NATO, UK SKYNET
7.9-8.4	1,2,3	up	DSCS, NATO, UK SKYNET

In addition to the fixed satellite allocation, the 3rd NOI also suggested the addition of the non-Government fixed service in the 3.3–3.4 GHz sub-band.

1.2 *Objective.* The objective of this task is to evaluate the impact on the Federal Government operation of non-Government fixed satellite use in the bands: 3.4–3.7 GHz, 5.6–5.9 GHz and 4.4–4.9 GHz and fixed service in the band 3.3–3.4 GHz.

1.3 *Approach.* This study provides an assessment, based upon presently available information, of the Government equipment currently used or planned for near future use in the frequency bands previously discussed. Also, expansion of the ISM allocation (wireless transmission of power) has been considered. A review of the sharing studies performed by the non-Government Fixed Satellite groups and the military has been made. Also, preliminary Government resource assessments and sharing analyses were made. The assessment and sharing analyses information was used to evaluate the impact of allocating the non-Government fixed satellite and fixed services in Government bands. Various Federal Government major system files, frequency files and planning documentation were used to obtain assessment information for the above-mentioned bands.

SECTION 2.—INITIAL FINDINGS

2.1 *Introduction.* A summary of the initial findings for the 3.3–3.7 GHz, 4.4–4.9 GHz and 5.625–5.925 GHz frequency bands are provided in this section. The findings are supported by the allocation and assessment information given in Sections 3 through 5 and the compatibility analysis given in Section 6. A further review of Sections 3 through 6 is suggested in order to obtain a more comprehensive understanding of band

utilization and the limitations of the electromagnetic compatibility (EMC) analysis.

2.2 *Initial Findings.* The results of the initial findings indicate that allocation of the proposed fixed satellite service in all of the three overall bands would have a dramatic national economic and performance impact upon the Government services. It appears that some spectrum could be made available with limited impact for use by the fixed satellite service. The bands and the spectrum space are:

Approximately 100 MHz of spectrum in the 3.5–3.7 GHz appears to be lightly occupied at present by land and shipboard radars. Potentially, there may be about 200 airborne radars operating in these bands; however, the equipments may operate below 3.5 GHz. The Navy operates a small quantity of safety of life services equipments in the sub-bands 3.55–3.70 GHz and the FAA is planning to use this band for ASR's. Thus, overall sharing procedures will be quite complex and must be developed before considering the fixed satellite allocation.

The 5825–5925 MHz band is heavily occupied by high powered radars which perform a variety of functions.

The band 4.4–4.9 GHz is one of the few bands allocated to the fixed and mobile services which are generally available to the military in all nations with which the U.S. is allied militarily. As such, this band is considered critical to inter-operability among tactical forces. Additionally, this band is used Nationally by high powered troposcatter and airborne mobile systems. Consequently, accommodation of the proposed fixed satellite allocation in the band 4.4–4.9 GHz, on a national basis, does not appear feasible.

The proposed fixed service allocations, as proposed on a secondary basis, would have a lesser impact upon operation of the radiolocation service. If the fixed service is allocated on a primary basis, it may place unacceptable operational constraints upon systems being developed for use in the 3.3–3.4 GHz sub-band.

A summary of the findings for each of the three bands follows:

3.3–3.7 GHz Bands—Utilization. There are operational military systems in these bands. New military major systems are being developed by the Air Force, Army and Navy. All of these systems are capable of operating in the bands below 3.5 GHz.

A review of the military equipment quantities shows there are several hundred Army ground-based radars, over 500 Air Force airborne radars and under 50 Navy shipboard radars capable of operating in these bands. The ground-based radars operate in the bands below 3.5 GHz. The airborne radars operate in the bands between 3.3–3.7 GHz. A portion of the shipboard radars are capable of operating above 3.6 GHz.

The assignment records[1] indicate that of the total assignments, 95% are military used principally for tactical, training and experimental purposes. A distribution of the frequency assignments shows that the 3.5–3.7 GHz band may not be heavily occupied on land within the continental U.S. The mobile radars (shipboard) operate within interference range of all coastal areas.

The FAA is the only non-military agency with significant present or planned use of the 3.3–3.7 GHz bands. Specifically, the FAA is planning to utilize the 3.5–3.7 GHz band for operation of low cost ASR's.

EMC Considerations. The proposed fixed satellite service (downlink) can cause interference to ground-based and shipboard radars if the maximum power flux density (PFD) limits of −152 dBw/m²/4 kHz are assumed. Preliminary analysis indicates that a 20 dB reduction in PFD would probably be an acceptable limit to preclude interference to radars.

Representative, preliminary coordination distances required to allow sharing between the existing and proposed services are:

Approximately 300 statute miles separation between terrestrial radiolocation and radionavigation service and satellite earth stations may be required to achieve the fixed satellite service performance criteria.

Distances of 250 miles between airborne radars[2] and earth stations (earth station mainbeam coupling does not occur) will be required.

The coordination distance between airborne radars[2] and the fixed service will vary from a maximum of 250 miles (low probability mainbeam coupling case) to about 10 miles (sidelobe coupling).

Coordination distances of up to 210 miles between terrestrial radars and fixed stations are required for the extreme case of mainbeam/mainbeam coupling. The distance is reduced to less than 85 miles for mainbeam/sidelobe coupling.

It is evident from the above coordination distances that Federal Government operations in the band between 3.3–3.7 GHz would be severely restricted if a large number of earth stations or fixed stations operated within the continental U.S.

4.4–4.99 GHz Band—Utilization. Military systems in this band consist of six operational or acquisition stage systems and nine developmental systems. It is intended that most of the system equipment can operate throughout the 4.4–4.9 GHz band. Two of the developmental systems use troposcatter equipment. One of these systems will contain 400 equipments that may operate in the troposcatter mode. Six of the developmental systems will use equipment within the mobile service that are air deployed.

Preliminary military equipment quantity information shows that the Army has over 1000 equipments capable of operating in this band. The Air Force has about 50 nomenclatured equipments listed which also indicates heavy use of this band. Navy information shows there are over 100 land mobile equipments in the bands between 4.4–4.9 GHz.

The assignment records reflect approximately 1250 military assignments within the US. These assignments are generally used for tactical and training purposes, data transmission, and a variety of testing and experimental purposes. The assignments, including those with high power, are evenly distributed across the 500 MHz of spectrum.

In addition to the above usage, the radio astronomy service observes the formaldehyde line frequency in the sub-band 4.825–4.835 GHz.

EMC Considerations. Emissions by the satellite (fixed satellite downlink) can cause interference to troposcatter systems if the troposcatter antennas point toward the geostationary orbit. Three general cases of PFD limits and restrictions upon the troposcatter pointing angles are:

±4 degrees for a PFD of −152 dBw/m²/4 kHz

±2 degrees for a PFD of −160 dBw/m²/4 kHz

[1] The number of frequency assignments may not be necessarily equated to the number of equipments, since a single assignment may represent a large number of equipments.

[2] The distances do not include consideration of newly developed radars that may operate in these bands.

A PFD of −173 dBw/m²/4 kHz would reduce the INR to −10dB and is probably an acceptable limit.

The coordination distance separation between troposcatter systems and satellite earth stations are approximately 300 miles.

The required coordination distance between aeronautical mobile stations and satellite earth stations is about 350 miles.

The fixed satellite (downlink) and radio astronomy service are incompatible. In-band emissions from the satellite would cause harmful interference to the radio astronomy service.

5.625–5.925 GHz Bands—Utilization. The military has six operational systems in these bands. Two of these systems, one Air Force and one Navy, each employs a large number of equipments. The Air Force has over 70 weather radars operating in bands 5.45 and 5.65 GHz. The Navy has about 600 shipboard equipments operating in the bands between 5.4–5.9 GHz.

A summary of the total military equipment which includes all systems shows that the Air Force has approximately 200 radars capable of operating in the bands between 5.625–5.925 GHz. The Navy has over 600 shipboard radars capable of operating in these bands. All of the radars operating above 5.8 GHz appear to be tunable. The Army is developing a large system for operation in the bands below 5.8 GHz. In addition, the Army operates on its test ranges, precision tracking radars with assignments up to 5.925 GHz.

The assignment records reflect over 600 assignments in these bands. Of this total, 529 are military and 71 are Commerce. These assignments are used for air defense, testing and training purposes and for weather radars. The 71 Commerce assignments are in support of the National Weather Service weather network. The Commerce assignments are made in the sub-band 5.6–5.65 GHz. There are about 150 assignments in the sub-band between 5.825–5.925 GHz. Only 12 of these assignments reflect fixed tuned equipments.

In addition to the above utilization, NASA has proposed Wireless Transmission of Power in the band 5800 ±50 MHz.

EMC Considerations. Weather and radiolocation radars are not compatible with the proposed fixed satellite (uplink) allocation. The INR during periods of radar mainbeam coupling would be 30 dB or greater.

The Wireless Transmission of Power system does not appear to be compatible with the proposed fixed satellite (uplink) allocation. Consideration was only given to the space-to-earth link since this is the most desirable mode of operation.

Section 3.—Allocation and Assessment of the 3.3–3.7 GHz Bands

3.1 *Present Frequency Allocation.* The existing International Frequency Allocation and National Provisions for the 3.3–3.7 GHz bands are provided in table 3.1. The National Provisions include the Governmental allocations, non-Government allocations and applicable footnotes. Under the National Provisions, the primary services and their associated bands are:

Radiolocation	3.3–3.7 GHz
Aeronautical radionavigation (ground-based)	3.5–3.7 GHz

In the 3.3–3.5 GHz band, Government radiolocation is primary and limited to the military agencies (G31). Survey operations are authorized for Government and non-Government use on a secondary basis (US 108). Non-Government radiolocation and amateur services are secondary services.

In the 3.5–3.7 GHz band, Government radiolocation and ground-based aeronautical radionavigation are primary services. Non-military radiolocation is secondary to the military service (G59). Non-Government radiolocation is a secondary service (US 110).

The International Provisions differ from the U.S. in that these provisions allow the fixed, fixed satellite, and mobile services to operate in the 3.3–3.7 GHz bands. The services and International Regions associated with each of the frequency bands are:

a. 3.3–3.4 GHz:

1. The radiolocation service is allocated on a primary basis worldwide.

2. In Region 1, the radionavigation service is also allocated (370).

3. The fixed and mobile services are also allocated in some countries (371).

4. The amateur service is allocated on a secondary basis in Regions 2 and 3.

Table 3.1 Frequency Allocation for the 3.3-3.7 GHz Bands

INTERNATIONAL			UNITED STATES				
Region 1 MHz	Region 2 MHz	Region 3 MHz	Band MHz 1	National Provisions 2	Government Allocation 3	Non-Government Allocation 4	Remarks 5
3300–3400 RADIOLOCATION 370 371	3300–3400 RADIOLOCATION Amateur 376		3300–3500	G, NG US108	RADIOLOCATION G31	Amateur Radiolocation	Although the band 10000–10500 MHz presently seems most suitable as a common frequency band for such survey operations in different countries, future development, if required, should be directed to the band 34.0–35.6 GHz, within the overall band 33.4–36.0 GHz, with no new development below 10000 MHz.
3400–3600 FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE Radiolocation 372 373 374 375	3400–3500 FIXED-SATELLITE (Space-to-Earth) RADIOLOCATION Amateur 376						
	3500–3700 FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE RADIOLOCATION	3500–3700 FIXED-SATELLITE (Space-to-Earth) RADIOLOCATION Fixed Mobile 377 378	3500–3700	G, NG US110	AERONAUTICAL RADIONAVIGATION (Ground-based) RADIOLOCATION G59 G110	Radiolocation	
3600–4200 FIXED FIXED-SATELLITE (Space-to-Earth) Mobile 374	3700–4200 FIXED FIXED-SATELLITE (Space-to-Earth) MOBILE 379		3700–4200	NG		FIXED FIXED-SATELLITE (Space-to-Earth) NG41	

Government (G) Footnotes

(These footnotes, each consisting of the letter "G" followed by one or more digits, denote stipulations applicable only to the Government.)

G31 In the band 3300-3500 MHz, the Government radiolocation is limited to the military services, except as provided by footnote US108.

G59 In the bands 902-928 MHz, 3100-3300 MHz, 3500-3700 MHz, 5250-5350 MHz, 8500-9000 MHz, 9200-9300 MHz, 13.4-14.0 GHz, 15.7-17.7 GHz and 24.05-24.25 GHz, all Government non-military radiolocation shall be secondary to military radiolocation, except in the sub-band 15.7-16.2 GHz airport surface detection equipment (ASDE) is permitted on a coequal basis subject to coordination with the military departments.

G110 Government ground-based stations in the aeronautical radionavigation service may be authorized between 3500 and 3700 MHz where accommodation in the 2700-2900 MHz band is not technically and/or economically feasible.

US Footnotes

(These footnotes, each consisting of the letters US followed by one or more digits, denote stipulations applicable to both Government and non-Government stations.)

US108 Within the bands 3300-3500 MHz and 10000-10500 MHz, survey operations, using transmitters with a peak power not to exceed five watts into the antenna, may be authorized for Government and non-Government use on a secondary basis to other Government radiolocation operations.

US110 In the frequency bands 3100-3300 MHz, 3500-3700 MHz, 5250-5350 MHz, 8500-9000 MHz, 9200-9300 MHz, 9500-10000 MHz, 13.4-14.0 GHz, 15.7-17.7 GHz, 24.05-24.25 GHz and 33.4-36 GHz, the non-Government radiolocation service shall be secondary to the Government radiolocation service and to airborne doppler radars at 8800 MHz, and shall provide protection to airborne surface detection equipment (ASDE) operating between 15.7-16.2 GHz.

International Footnotes

(These footnotes come from the Radio Regulations, Geneva, 1959, the Final Acts of the Space EARC, Geneva, 1963, the Final Acts of the Maritime Mobile WARC, Geneva, 1967, or the Final Acts of the Space WARC, Geneva, 1971.)

370 In Albania, Austria, Bulgaria, Hungary, Poland, Portugal, Roumania, Switzerland, Czechoslovakia and the U.S.S.R., the band 3 300-3 400 MHz is also allocated to the radionavigation service.

371 In Austria, Greece, Norway, the Netherlands, Portugal and Sweden, the band 3 300-3 400 MHz is also allocated to the fixed and mobile services.

372 In Austria, the band 3 400-3 600 MHz is also allocated to the radionavigation service.

373 In Denmark, Norway, Sweden and Switzerland, the fixed, mobile, radiolocation and fixed-satellite services operate on a basis of equality of rights in the band 3 400-3 600 MHz.

374 In the United Kingdom, the band 3 400-3 770 MHz is allocated to the radiolocation service.

375 In Austria, Israel, Netherlands, F. R. of Germany and the United Kingdom, the band 3 400-3 475 MHz is also allocated, on a secondary basis, to the amateur service.

376 In China, India, Indonesia, Japan and Pakistan the band 3 300-3 500 MHz is also allocated to the fixed and mobile services.

377 In China and Japan the band 3 500-3 700 MHz is also allocated to the fixed and mobile services.

378 In Japan, in the band 3 620-3 700 MHz, the radiolocation service is excluded.

b. 3.4–3.5 GHz:

1. The radiolocation service is allocated on a primary basis in Regions 2 and 3 and on a secondary basis in Region 1.

2. The fixed-satellite service is allocated on a primary basis worldwide.

3. In Austria, the radionavigation service is also allocated in the band 3.4–3.6 GHz (372).

4. The fixed and mobile services are also allocated in Region 1 (373) and Regions 2 and 3 (376).

5. The amateur service is allocated on a secondary basis in Regions 2 and 3.

c. 3.5–3.7 GHz:

1. The radiolocation service is allocated on a primary basis in Regions 2 and 3 (except Japan (378)).

2. The fixed-satellite service is allocated on a primary basis worldwide.

3. The fixed service is allocated on a primary basis in Regions 1 and 2 and on a secondary basis in Region 3.

4. The mobile service is allocated on a primary basis in Region 2 and on a secondary basis in Regions 1 and 3.

5. In Austria, the radionavigation service is also allocated in the band 3.4–3.6 GHz.

3.2 *Proposed Changes to the Present Allocations.* The 3rd NOI contained proposals for the addition of several services in portions of the spectrum between 3.3–3.7 GHz. The proposed additions, as provided by the Table of Allocations, are:

1. In Region 2, the addition of the fixed service on a secondary basis in the band 3.3–3.4 GHz.

2. In Region 1, the addition of the amateur service on a secondary basis in the band 3.4–3.41 GHz.

3. Worldwide addition of the amateur-satellite service on a secondary basis in the band 3.4–3.41 GHz.

4. In Region 2, the addition of the aeronautical radionavigation service on a primary basis in the band 3.5–3.7 GHz.

In addition to the proposals set forth above, the 3rd NOI also contained discussions on spectrum expansion requirements of the commercial fixed-satellite service. The attempt to obtain a fixed satellite downlink allocation in the band 3.4–3.7 GHz was briefly discussed. This proposed downlink would be paired with a proposed uplink in the band 5.625–5.925 GHz.

3.3 *Military Systems Operating in the Band.* The military (Air Force, Army and Navy) have several radar systems that currently operate or are being developed to operate in the bands 3.3–3.7 GHz. Classified information concerning these systems has been made available to the FCC staff. A brief functional description and operational status of some Air Force and Army systems follows:

Air Force. The equipments functioning as part of the Air Force systems do not operate above 3.5 GHz. One of these systems uses electronic warfare simulators in all types of aircraft. Bomb directed controls are also employed. This system is presently operational.

The SAC Automated Command Control System (SACCS) transmits, collects, processes and displays data to assist CINCSAC in command and control of armed forces. The system is presently operational.

Army. The Army system with equipment capable of operating in this band is used to provide defense against aircraft and missiles. Training sites exist in Florida and Texas. The system equipment does not tune above 3.5 GHz.

Navy. Navy systems provide search, tracking, and navigation functions. Due to the various functions performed, capability and flexibility to operate throughout the band is critical to successful shipboard electromagnetic compatibility.

3.4 *Military Equipment Summary.* Information on Air Force, Army and Navy present and planned worldwide utilization of the 3.3–3.7 GHz band is provided in this section.

Air Force. A list of the Communication-Electronic (C–E) equipment indicates that the Air Force has 9 types of nomenclatured equipments capable of operating in bands 3.3–3.7 GHz. A few of these equipments are ground-based radars; however, over 500 are airborne radionavigation radars. Approximately 50% of these airborne radars tune across the band 3.4–3.7 GHz. The ermaining 50% of the airborne radars tune in band 3.3–3.6 GHz.

Army. An Army C–E equipment list contains three types of nomenclatured equipments capable ofo perating in 3.1–3.5 GHz bands. These represent a radar with planned operational availability beginning in 1980, and a total of approximately 300 operational radars. Theo perational availability of the present operational radars extend to 1985.

Navy. A Navy equipment inventory list indicates that th e are five types of shipboard radars capable of operating in the 3.3–3.7 GHz bands. These five nomenclatures represent equipments that are shipboard search, tracking or navigation radars. The search/tracking radars are tunable with a maximum operational frequency of 3.6 GHz. The navigation radars operate within the sub-band 3.55–3.7 GHz.

3.5 *Government usage of bands within the U.S.* The frequency records contain over 60 frequency assignments in the 3.3–3.7 GHz bands. Of this total, one is a National Aeronautics and Space Administration (NASA) assignment and the remainder are military. The station class associated with these assignments are radiolocation land and mobile stations and experimental stations. The four Government agencies currently using the bands 3.3–3.7 GHz and their approximate percentage of frequency assignments are:

Agencies:	*Percent of total*
Air Force	39
Army	20
Navy	39
NASA	<2

A distribution of frequency assignments for each 100 MHz of spectrum in the bands between 3.3 to 3.7 GHz is provided in table 3.2. The number of assignments associated with each agency are also given. Many of the equipments tune across several bands, thus, table 3.2 does not provide the exact number of records.

Table 3.2 Frequency Assignment*/ Distribution for the 3.3-3.7 GHz Bands

AGENCY	FREQUENCY SUB-BAND, GHz			
	3.3-3.4	3.4-3.5	3.5-3.61	3.6-3.71
AF	21	19	9	11
AR	11	11	1	1
N	13	17	7	2
NASA	1	1		
Total	46	48	17	14

NOTE:

1. The FAA is planning to use the band 3.5-3.7 GHz for low cost ASR's in the future.

*/ Does not necessarily indicate the number of equipments or systems operating in a frequency subband.

The assignments were used to obtain data on band usage for each of the Government agencies within the US. A summary of the usage for each of the four agencies, as well as FAA planned usage of the 3.5–3.7 GHz band, is provided in this sub-section.

Air Force. The Air Force uses this band for tactical, testing, evaluation and experimental purposes. The Air Force currently has assignments in the 3.3–3.7 GHz bands that are distributed in 11 states. Of these assignments, the majority have experimental station classes. The remaining assignments are radio-location, land and mobile stations. Most of these assignments are land-based stations used for testing. The remainder concern an airborne tactical radar that may be deployed anywhere within the US.

Army. The Army uses this band for operation of air defense radars and for experimental testing. The transmitter locations associated with these assignments are Alaska, Alabama, California, Florida, New Mexico and Utah. Of the assignments, the majority are radiolocation land stations and the remainder are experimental stations.

Federal Aviation Administration (FAA). The FAA plans to develop low cost Airport Surveillance Radars (ASR) in the 3.5–3.7 GHz band. Projected plans indicated that there will be at least 40 ASR's in operation within the next ten years. These radars would employ coaxial magnetrons or klystron power amplifiers with a peak power of 50 kW to 100 kW and would operate in conjunction with a frequency scanning antenna.

Navy. The Navy uses the 3.3–3.7 GHz bands for operation of shipboard radars, training and testing of developmental radar systems. The station classes associated with these assignments are radiolocation land station, radiolocation mobile station and experimental stations.

The radiolocation land stations and experimental stations are located in California, Florida, Maryland, New Mexico, Puerto Rico, Tennessee, Virginia, Virgin Islands, and Washington. These stations are used for training and testing purposes.

The remaining assignments are radiolocation mobile stations that are shipboard radars representing several equipments. The shipboard radars may operate within the coastal areas of the U.S.

National Aeronautics and Space Administration (NASA). NASA has one experimental radar capable of operating in the 3.1–3.5 GHz bands. The radar is used for tracking V/STOL vehicles in California.

Section 4. Allocation and Assessment of the 4.4–4.99 GHz Band

4.1 *Present Frequency Allocation.* The existing International Frequency Allocation and National Provisions for the 4.4–4.99 GHz band are given in table 4.1.

The National Provisions allocate the fixed and mobile services, on a primary basis. In the band 4.825–4.835 GHz, every practical effort will be made to avoid assignment of frequencies in the fixed and mobile service (US203) due to radio astronomy observation.

The International Provisions allocate the fixed and mobile services on a primary basis in the 4.4–4.99 GHz band. The International Provisions also allocate the fixed-satellite service (earth-to-space), on a primary basis, in the band 4.4–4.7 GHz. All of the international footnotes (233B, 354, 382A and 382B) pertain to consideration of radio astronomy operations in the band 4.7–5.0 GHz.

4.2 *Proposed Changes to the Present Allocations.* The 3rd NOI contained discussions pertaining to the accommodation of the fixed satellite and radio astronomy proposed allocation within the band 4.4–4.9 GHz. Neither of these proposed allocations was provided in the Table of Allocations. However, a proposal was included to allocate Radio Astronomy as a primary service in the 4.95–4.99 GHz portion of the band.

The radio astronomers have expressed a desire to upgrade the band 4825–4835 MHz to table status. The radio astronomy service uses this band for observation of the formaldehyde line.

A proposal that would provide additional spectrum for the non-Government fixed satellite service in the band 4.4–4.9 GHz was briefly discussed in the 3rd NOI. This proposed fixed satellite allocation would be used for fixed satellite downlink purposes. A companion uplink would be provided by the bands 6.425–6.925 GHz which are presently allocated for non-Government purposes by the National Provisions.

TABLE 4.1

Frequency Allocation for the 4.4–4.9 GHz Band

INTERNATIONAL			UNITED STATES				
Region 1 MHz	Region 2 MHz	Region 3 MHz	Band MHz 1	National Provisions 2	Government Allocation 3	Non-Government Allocation 4	Remarks 5
4400–4700	FIXED FIXED-SATELLITE (Earth-to-space) MOBILE		4400–4990	G US203	FIXED MOBILE		Unprotected radio astronomy observations are being carried out in the band 4950–4990 MHz. Users should, where possible, bear in mind the needs of the radio astronomy service in their future planning for the use of this part of the band.
4700–4990	FIXED MOBILE 233B 354 382A 382B						

US Footnotes

(These footnotes, each consisting of the letters US followed by one or more digits, denote stipulations applicable to both Government and non-Government stations.)

US203 Government and non-Government radio astronomy observations of the formaldehyde line frequencies 4825-4835 MHz and 14.485-14.515 GHz may be made at certain Radio Astronomy Observatories as indicated below:

Bands to be Observed		Observatory
4 GHz	14 GHz	
X	X	National Radio Astronomy Observatory Green Bank, W. Va.
X	X	Tucson (Kitt Peak), Ariz.
X	X	Naval Research Laboratory Maryland Point, Md.
X	X	Hat Creek Observatory (U of Calif.) Hat Creek, California
X	X	Haystack Facility (MIT-Lincoln Lab) Tyngsboro, Mass.
X		Agassiz Station (Harvard College) Harvard, Mass.
X	X	Owens Valley Radio Observatory (Cal. Tech.) Owens Valley, California
X		University of Michigan Dexter, Michigan
X		Harvard Observatory Ft. Davis, Texas
	X	University of Texas Ft. Davis, Texas
	X	Aerospace Corp. El Segundo, California (to be moved to Owens Valley)

Every practicable effort will be made to avoid the assignment of frequencies to stations in the fixed or mobile services in these bands. Should such assignments result in harmful interference to these observations, the situation will be remedied to the extent practicable.

International Footnotes

(These footnotes come from the Radio Regulations, Geneva, 1959, the Final Acts of the Space EARC, Geneva, 1963, the Final Acts of the Maritime Mobile WARC, Geneva, 1967, or the Final Acts of the Space WARC, Geneva, 1971.)

233A In Argentina and Uruguay, the bands 36.65-36.85 MHz, 41.15-41.35 MHz and 45.65-45.85 MHz, and in Argentina, Brazil and Uruguay the band 170.55-170.95 MHz, are allocated to the radio astronomy service and no assignments shall be made to the fixed and mobile services in these bands.

354 In Albania, Bulgaria, Hungary, Poland, Roumania, Czechoslovakia and the U.S.S.R., the bands 1 660-1 690 MHz, 3 165-3 195 MHz, 4 800-4 810 MHz, 5 800-5 815 MHz and 8 680-8 700 MHz are also used for radio astronomy observations.

382A Radio astronomy observations on the formaldehyde line (rest frequency 4 829.649 MHz) are being carried out in a number of countries under national arrangements. Administrations should bear in mind the needs of the radio astronomy service in their future planning of the band 4 825-4 835 MHz.

382B Radio astronomy observations in the band 4 950-4 990 MHz are being carried out in a number of countries under national arrangements. Administrations should bear in mind the needs of the radio astronomy service in their future planning of this band.

4.2 *Military Systems Operating in the Band.* The military (Air Force, Army and Navy) have a large number of operational and developmental communication systems with equipment capable of operation in the band 4.4-4.9 GHz. Classified information concerning these systems has been made available to the FCC staff. Most of the nomenclatured equipments functioning as part of these systems have the capability of turning from 4.4 to 4.99 GHz. A brief functional description of most of these systems is discussed herein.

Air Force. The Air Force systems are summarized below:

A system designed to provide, via relay pods carrier aboard an aircraft, command to a Remotely Piloted Vehicle (RPV) plus telemetry and video information from the RPV, is in the developmental stage.

The BAREBASE system is a concept designed to rapidly deploy a tactical operation to an airstrip. The equipment that is used will depend on where BAREBASE is deployed and which Air Force units will provide the support. This system is presently operational.

A system that will enable reconnaissance aircraft to relay infrared sensor data to remote ground terminals is in the research/development stage.

The Tactical Air Control System (TACS) provides a transportable tactical air control system capable of directing and controlling all tactical air operations. The TACS consists of 6 super systems. Two of these systems, the Air Force Component Command Post (AFCCP) and Forward Air Control Post, have equipment that operates in this band. This system is presently in the operational and acquisition phase.

The Television Ordnance Scoring System (TOSS) is an ordnance scoring system that locates the impact point of ordnance dropped from aircraft in a training or operational test environment. This system is in the procurement stage.

The WHITE ALICE is a troposcatter and microwave system that provides communications throughout Alaska. This system has been an operational system for several years and may be phased out in the near future.

A family of high speed digital troposcatter radios are being developed to help satisfy the communications requirements of tactical forces in 1980-1990. These sets will be capable of providing reliable communications over ranges up to 200 miles in the troposcatter mode and shall also be capable of operating as line of sight equipment. Approximately 400 units of these predevelopmental systems are planned for worldwide tactical deployment.

Army. The Army sytsems that have the capability of operating in this band are the Army Area Communications (AACOM) system, the AQUILA RPV system and an Area Wideband System.

The AACOM is an integrated communications system used to provide secure multichannel communications for Tactical Field Army Units. This system is in the acquisition stage.

The AQUILA RPV system is used to develop and test technology, perform real time surveillance, artillery adjustments, target location, acquisition and designation. The system is in the developmental stage.

An Area Wideband System will serve communications information transfer needs in an interconnected network. This system will provide digital high rate information transfer systems among multiple users. Planned initial operation of this system is 1978.

Marine Corps. The Marine Corps system is the Marine Air Command and Control System (MACCS). The MACCS permits centralized coordination and supervision of air

operations by the Marine Air Ground Task Force (MAGTF) aviation combat element commander. The major support element of MACCS are: Tactical Air Command Center (TACC), Tactical Air Operations Center (TAOC), Direct Air Support Center (DASC), Air Support Radar Team (ASRT), Tactical Air Control Parties (TACP) and the Marine Air Traffic Control Unit (MATCU). The system is operational with additional research, development, test and evaluation being undertaken. Certain links of this system are also capable of operating in the troposcatter mode.

Navy. The Navy systems are the Light Airborne Multipurpose System (LAMPS) and the Integrated Target Control System (ITCS).

The LAMPS provides various missions, such as anti-submarine warfare, artillery spotting, air to sea rescue. This system is in the developmental stage.

The ITCS is a drone control system used for control of various stages of drones. This system is in the developmental stage.

Air Force, Army, Navy. The TRI TAC systems will provide a compatible Tri service (Air Force, Army and Navy) communications system. The system is in the research/developmental stage.

4.4 *Military Equipment Summary.* Preliminary information on Air Force, Army and Navy present and planned worldwide spectrum usage of the 4.4–4.9 GHz band is summarized in this section.

Air Force. The list of C–E equipment indicates that the Air Force has about 50 types of nomenclatured equipments capable of operating in this band. These equipments are used for microwave relay, troposcatter communications, drone control, data relay, and telemetry. Approximately 20% of the nomenclatured equipments may be used for troposcatter. Of the total nomenclatured equipments, the majority are capable of operating throughout the band 4.4–4.9 GHz.

Army. The list of C–E equipment contains about 10 types of Army nomenclatured equipments that are capable of operating in the band 4.4–4.9 GHz. The Army uses these equipments for telemetry, data links, multichannel radar relay and nontactical command air-to-ground video purposes. Of this total, the majority of the nomenclatured equipments may be used as troposcatter systems. The nomenclatured equipments represent a quantity in excess of 1000. The planned equipment operational availability extends into the 1990 timeframe.

Navy. Navy information indicates there are 112 land mobile (including airborne) equipments operating in this band.

4.5 *Government Usage of Bands Within the U.S.* There are 1305 frequency assignments in the 4.4–4.9 GHz band. Of the total assignments, approximately 96% are military and of these, approximately 70% are used for some form of tactical or tarining operation.

The 1305 frequency assignments are used by six Government agencies. The six agencies and the approximate percentage of frequency assignments for each agency is tabulated as follows:

Agency:	*Percent of total*
Air Force (AF)	36
Army (AR)	18
Commerce (C)	<1
Energy Research and Development Administration (ERDA)	3
Navy (N)	42
National Aeronautics and Space Administration (NASA)	<1

A distribution of frequency assignments for each 100 MHz of the spectrum between 4.4–4.9 GHz and each agency is given in table 4.2. The assignment total for the 5 sub-bands does not equal 1305 since some of the assignments tune across several of these sub-bands. For example, the Army has 59 assignments that tune between 4.4 and 4.8 GHz and the Air Force has one assignment that tunes between 4.4 and 4.8 GHz.

The distribution of assignments having high transmit power (≥1 kW) is provided in table 4.3. As shown, the assignments with high transmit power characteristics are fairly evenly distributed in the five sub-bands. The station class associated with these high power stations are: fixed stations (FX), land stations of the mobile service (FL), telecommand mobile stations (MOD) and experimental stations (X[ ]).

The frequency records were used as the primary source to obtain data upon Government usage of the 4.4–4.9 GHz band within the US. A summary of the usage for each of the six Government agencies follows:

Air Force. A large percentage (about 80%) of the Air Force assignments in the 4.4–4.9 GHz band are for tactical and training use. Training activities include both Air National Guard and active duty units and are primarily associated with mobile troposcatter equipment. The balance of the AF assignments are used in a variety of test and developmental activities. These activities appear to be mainly associated with the transmission of wideband video and data links. The data link assignments are air-to-ground.

TABLE 4.3
Frequency Assignment Distribution for the 4.4–4.9 GHz Band

	FREQUENCY SUB-BAND GHz				
AGENCY	4.4–4.5	4.5–4.6	4.6–4.7	4.7–4.8	4.8–4.9
AF	91	120	80	96	90
AR	97	98	83	94	99
C	0	0	0	1	0
ERDA	7	7	10	9	8
N	113	106	127	102	99
NASA	2	1	2	0	2
TOTAL	310	332	302	302	298

TABLE 4.4
Distribution of Frequency Assignments Having High Transmit Power (≥1 kW)

FREQUENCY SUB-BAND, GHz	NUMBER OF ASSIGNMENTS
4.4 – 4.5 GHz	149
4.5 – 4.6 GHz	150
4.6 – 4.7 GHz	144
4.7 – 4.8 GHz	148
4.8 – 4.9 GHz	149

Army. Army usage of the 4.4–4.9 GHz band divides into two categories: (1) tactical and training involving troposcatter equipment operating 1 to 10 kW power levels located in 28 States, and (2) operational point-to-point microwave communications equipment operating at low power (approximately 1 watt) levels. The first category represents about 65% of the Army assignments in the band and the second category, about 25%. The remaining 10 percent are data links or experimental RPV uplink assignments.

Commerce. The Commerce assignment is a low powered fixed station located in Boulder, Colorado. The fixed station is used for transmission of video information.

ERDA. The ERDA's forty-one assignments in the 4.4–4.9 GHz band are primarily used for telemetry and data relay stations in Nevada but there is a small network in Col-

orado and a point-to-point video link in California. The ERDA is also developing a new emergency system for use in the 4.4–4.9 GHz band. The system is a microwave link used to provide for the remote identification and analysis of nuclear devices. Two systems are being procured, requiring a total of 12 transmitters and 12 receivers. The system will be capable of being transported to any location within the US.

Navy. The majority of the Navy assignments (approximately 85%) are designated for use as tactical and training in accordance with note S189. Most of these assignments also carry the note S017 indicating that the frequencies are being used to train operators in the use of the equipment, such training probably taking place at Marine Corps facilities, and include the troposcatter mode of operation. The balance of the Navy assignments (about 15%) are designated for a variety of uses including communications with drones and aircraft from land-based and ship-based stations, experimental development and testing of systems, and mobile telecommand for drone control. An extremely large number of the Navy assignment contains NRM (number) fields in the remarks column. This indicates that the equipment quantity represented by these assignments are quite large.

NASA. Most NASA assignments in the 4.4–4.9 GHz band (of which there are less than ten) are associated with a point-to-point relay network centered in California. NASA also has one assignment for experimental research and one area wide assignment for a flight telemetering station.

SECTION 5.—ALLOCATION AND ASSESSMENT OF THE 5.6–5.925 GHz BAND

5.1 *Present Frequency Allocation.* The existing International Frequency Allocations and the National Provisions for the 5.6–5.925 GHz frequency bands are provided in table 5.1. The National Provisions include the Government allocations, non-Government allocations and applicable footnotes. The primary services and their associated bands for the National Provisions are:

	Gigahertz
Maritime radionavigation	5.60–5.65
Meteorological aids	5.60–5.65
Radiolocation	5.65–5.925

In the 5.6 to 5.65 GHz band, maritime radionavigation and meteorological aids are primary, on an equal basis (387), for both Government and non-Government agencies. The maritime radionavigation service is limited to shipboard radars (US65). Government radiolocation is primarily for the military services; however, limited secondary use is permitted by other Governmental agencies in support of experimentation and research programs (G56). Non-Government radiolocation is secondary to Government radiolocation (US51).

In the 5.65 to 5.925 GHz band, Government radiolocation is the primary service; however, this service is limited to the military agencies (G2). Industrial, Scientific and Medical (ISM) equipment operates within 5800±75 MHz band segment and the radiocommunication services must accept any harmful interference that may be received from ISM (391). The amateur secondary service is the only non-Government service permitted in this band and it is on a secondary basis (US34).

The International Frequency Allocations differ from the U.S., in that these allocations allow fixed, fixed-satellite, mobile and space research to operate in the portions of these bands. A summary of the International Provisions is tabulated for each frequency band below:

a. 5.47–5.65 GHz:

1. Maritime radionavigation is allocated on a primary basis worldwide.

2. Radiolocation is allocated as a secondary service worldwide.

Table 5.1 Frequency Allocation for the 5.6-5.925 GHz Band

INTERNATIONAL			UNITED STATES				
Region 1 MHz	Region 2 MHz	Region 3 MHz	Band MHz 1	National Provisions 2	Government Allocation 3	Non-Government Allocation 4	Remarks 5
5470–5650 MARITIME RADIONAVIGATION Radiolocation 386 387			5470–5600	G, NG US50 US65	MARITIME RADIONAVIGATION Radiolocation G56	MARITIME RADIONAVIGATION Radiolocation	
			5600–5650	G, NG 387 US51 US65	MARITIME RADIONAVIGATION METEOROLOGICAL AIDS Radiolocation G56	MARITIME RADIONAVIGATION METEORLOGICAL AIDS Radiolocation	
5650–5670 RADIOLOCATION Amateur 388 389			5650–5925	G, NG 391 US34 US100 (ISM 5800 ± 75 MHz)	RADIOLOCATION	Amateur	
5670–5725 RADIOLOCATION Amateur Space Research (Deep Space) 388 389 389A							
5725–5850 FIXED-SATELLITE (Earth-to-Space) RADIOLOCATION Amateur 354 388 390 391 391A	5725–5850 RADIOLOCATION Amateur 389 391 391A				G2		
5850–5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE 391	5850–5925 RADIOLOCATION Amateur 391	5850–5925 FIXED FIXED-SATELLITE (Earth-to-space) MOBILE Radiolocation 391					

FOOTNOTES

Government (G) Footnotes

(These footnotes, each consisting of the letter "G" followed by one or more digits, denote stipulations applicable only to the Government.)

G2 In the bands 216-225, 420-450, 1300-1400, 2300-2450, 2700-2900, 5650-5925 and 9000-9200 MHz, the Government radiolocation is limited to the military services.

G56 Government radiolocation in the bands 1215-1300, 2900-3100, 5350-5650 and 9300-9500 MHz is primarily for the military services; however, limited secondary use is permitted by other Government agencies in support of experimentation and research programs. In addition, limited secondary use is permitted for survey operations in the band 2900-3100 MHz.

US Footnotes

(These footnotes, each consisting of the letters US followed by one or more digits, denote stipulations applicable to both Government and non-Government stations.)

US34 The only non-Government service permitted in the bands 220-225 MHz, 1215-1300 MHz, 2300-2450 MHz and 5650-5925 MHz is the amateur service. The amateur service shall not cause harmful interference to the radiolocation service.

US50 The non-Government radiolocation service may be authorized in the band 5470-5600 MHz on the condition that it does not cause harmful interference to the maritime radionavigation service or to the Government radiolocation service.

US51 In the bands 5600-5650 MHz and 9300-9500 MHz, the non-Government radiolocation service shall not cause harmful interference to the Government radiolocation service.

US65 The use of the band 5460-5650 MHz by the maritime radionavigation service is limited to shipborne radars.

US100 In the Additional Protocol to the Final Acts of the Space EARC, Geneva, 1963, a declaration on behalf of the USA states that the USA cannot accept any obligation to observe the exception claimed by Cuba in those footnotes to the Table of Frequency Allocations which were adopted by the EARC and which specifically named Cuba.

International Footnotes

(These footnotes come from the Radio Regulations, Geneva, 1959, the Final Acts of the Space EARC, Geneva, 1963, the Final Acts of the Maritime Mobile WARC, Geneva, 1967, or the Final Acts of the Space WARC, Geneva, 1971.)

354 In Albania, Bulgaria, Hungary, Poland, Roumania, Czechoslovakia and the U.S.S.R., the bands 1 660–1 690 MHz, 3 165–3 195 MHz, 4 800–4 810 MHz, 5 800–5 815 MHz and 8 680–8 700 MHz are also used for radio astronomy observations.

386 In Albania, Bulgaria, Hungary, Poland, Roumania, Czechoslovakia and the U.S.S.R., the band 5 470–5 650 MHz is also allocated to the aeronautical radionavigation service.

387 Between 5 600–5 650 MHz, ground-based radars used for meteorological purposes are authorized to operate on the basis of equality with stations of the maritime radionavigation service.

388 In the F. R. of Germany, the band 5 650–5 775 MHz is allocated to the amateur service and the band 5 775–5 850 MHz is allocated to the fixed service.

389 In China, India, Indonesia, Japan and Pakistan the band 5 650–5 850 MHz is also allocated to the fixed and mobile services.

389A In Bulgaria, Cuba, Hungary, Poland, Roumania, Czechoslovakia and the U.S.S.R., the space research service is a primary service in the band 5 670–5 725 MHz.

390 In Albania, Bulgaria, Hungary, Poland, Roumania, Czechoslovakia and the U.S.S.R., the band 5 800–5 850 MHz is allocated to the fixed, mobile and fixed-satellite services.

391 The frequency 5 800 MHz is designated for industrial, scientific and medical purposes. Emissions must be confined within the limits of ± 75 MHz of that frequency. Radiocommunication services operating within those limits must accept any harmful interference that may be experienced from the operation of industrial, scientific and medical equipment.

391A Radio astronomy observations are being carried out in the band 5 750–5 770 MHz and 36.458–36.488 GHz in a number of countries under national arrangements. Administrations are urged to take all practicable steps to protect radio astronomy observations in these bands from harmful interference.

3. The aeronautical radionavigation service is also allocated in Soviet Bloc countries (386).

4. In the band 5.6–5.65 GHz, the meteorological aids service is allocated on a co-equal basis with maritime radionavigation (387).

b. 5.65–5.725 GHz:

1. The radiolocation service is allocated on a primary basis worldwide.

2. The amateur service is allocated on a secondary basis worldwide.

3. The fixed and mobile services are also allocated in this band (389).

4. The space research service is allocated in the band 5.67–5.725 GHz, on a primary basis, in some Soviet Bloc countries (389A).

c. 5.725–5.85 GHz:

1. The radiolocation service is allocated on a primary basis worldwide.

2. The fixed-satellite service is allocated on a primary basis in Region 1.

3. The amateur service is allocated on a secondary basis worldwide.

4. The fixed and mobile services are also allocated in this band (388, 389, 390).

5. The frequency 5.8 GHz is designated for ISM purposes worldwide (391).

6. Radio astronomy observations are being carried out in a number of countries (354, 391A) in the bands 5.75–5.77 GHz and 5.8–5.815 GHz.

d. 5.85–5.925 GHz:

1. The radiolocation service is allocated on a primary basis in Region 2 and on a secondary basis in Region 3.

2. The fixed, mobile and fixed-satellite services are allocated on a primary basis in Regions 1 and 3.

3. The amateur service is allocated on a secondary basis in Region 2.

5.2 *Proposed Changes to the Present Allocation.* The 3rd NOI contained discussions proposing the addition of three services and an expansion of ISM equipment within the bands 5.625–5.925 GHz. A summary of these proposed allocations follows:

1. Addition of the Amateur Satellite service on a secondary basis. The frequency limits of allocation would be 5.65–5.67 GHz. This allocation was also proposed in the Table of Allocations.

2. Spectrum for use by the common carrier fixed service in the bands of 5.650–5.925 GHz was requested.

3. The request to obtain spectrum in the 5.625–5.925 GHz bands for use by the commercial fixed satellite service was discussed.

4. Footnote 357A has been proposed in the Table of Allocations to provide for wireless transmission of power. This footnote states:

"The frequencies 2450 MHz and 5800 MHz are designated for the wireless transmission of power. Emissions must be confined within ±50 MHz of the frequencies designated. This electrical energy transfer may be effected from space-to-earth, space-to-space, or point-to-point on the earth."

5.3 *Military Systems Operating in the Band.* The military has several developmental and operational radar systems with equipment capable of operating in the bands 5.6–5.925 GHz. Classified information concerning these systems has been made available to the FCC staff. A brief description of some of the military systems follows:

Air Force. The Air Force systems include the following systems.

The All Weather System (AWS) is an atmospheric environmental program that is a continuing acquisition and procurement program to improve and modernize the air weather service in support of military operations and command and control systems. The system is presently operational in the US.

Electronic warfare simulators are used in all types of aircraft. Bomb directed controls are also employed. This system is presently operational.

A part of the Air Defense Command and Control Network is a system which provides for surveillance, identification, command and control and interception of hostile airborne targets. With the phase-out of this system, a Joint Surveillance System (JSS) between the FAA, air Defense Command and Canada will be implemented to perform the U.S. surveillance and peacetime control missions of detection, identification and interception. The JSS will provide the means for rapid transition of the command, control and surveillance functions.

Navy. Navy systems include the Tarter/Terrier/Talos system. This system is a surface-to-air and surface-to-surface missile system. The primary role of this system is fleet air defense with a secondary role of anti-missile and anti-ship defense. These systems include search, acquisition, tracking, and navigation functions and are currently operational systems.

5.4 *Military Equipment Summary.* Information on military present and planned worldwide spectrum utilization of the 5.625–5.925 GHz bands is summarized in this section.

Air Force. A list of the Communictions-Electronic (C–E) equipment indicates that the Air Force has about 25 types of nomenclatured equipments capable of operating in this band. Approximately 75% of these nomenclatured equipments tune over the entire frequency band (5.60–5.925 GHz). These equipments are principally used as fixed and mobile ground radars and as pilotless carrier transponders or radars. Information currently available indicates that the nomenclatured equipment represent total equipment quantities in excess of 200 units.

Army. Information of Army C–E equipments indicates about 10 types of nomenclatured equipments are either operating or planned for operation in this band. Some of these nomenclatured equipments will operate in the band below 5.75 GHz. The remainder may operate within the entire band (5.625–5.925 GHz). The operational availability extends to 1990 for a majority of the nomenclatured equipments.

The Army has indicated that the loss of the 5825–5925 MHz band for use by radars at military test ranges would severely reduce the capability of those ranges to support the weapons development programs. Such delays of the weapons development programs across the U.S. will have a serious effect upon the Defense Readiness posture.

Navy. The Navy has about 10 types of nomenclatured equipments, representing an equipment quantity of about 600, operating in the 5.625–5.925 GHz band. All of these

equipments are shipboard radars and are capable of operating in the 5.625–5.700 GHz frequency range. Some of the radars use frequency agility techniques. Approximately 100 radars are capable of operating above 5.85 GHz. It is projected that equipment quantities will increase by approximately 26% by 1990.

5.5 *Government Usage of Bands Within the U.S.* There are over 600 frequency assignments in the 5.6–5.925 GHz band. Approximately 83% of the total assignments are military (DOD) and of these, about 75% are used as land and mobile radiolocation radars and weather radars. The remaining 25% of the assignments are used as radionavigation, mobile and experimental stations.

The eight Government agencies with frequency assignments in this band and the approximate percentage for each of these agencies are:

Agency:	Percent of total
Air Force	55
Army	15
Commerce	11
ERDA	2
Interior	1
Navy	13
NASA	2
NS	>1

A frequency assignment distribution for four sub-bands of the overall band (5.6–5.925) is given in table 5.2. The total for the 4 sub-bands cannot be equated to the total, since approximately 70% of these assignments tune across multiple sub-bands, i.e., in the 5.825–5.925, only 12 assignments are fixed tuned.

Table 5.3 Frequency Assignment Distribution for the 5.6–5.925 GHz Bands

AGENCY	FREQUENCY SUB-BAND, GHz			
	5.6–5.65	5.65–5.725	5.725–5.825	5.825–5.925
AF	194	139	141	83
AR	35	47	56	24
C	74	0	0	0
ERDA	1	10	7	1
I	3	0	0	0
N	42	40	54	32
NS	0	0	0	1
NASA	4	6	5	4
Total	343	242	263	145

A summary of the usage within the U.S. for each Governmental agency follows:

Air Force. The Air Force uses this band principally for radiolocation and meteorological radar functions. The remaining assignments are used for radionavigation, telecommand land and experimental stations.

The radiolocation land stations are located throughout the U.S. and its possessions. Most of these stations are used for various air defense operations and missile testing.

The radiolocation mobile stations are deployed throughout the 50 states and in the Pacific. Primarily, the equipment is used as: aircraft radar transponders, for operational and pre-flight testing missiles, for tracking or reentry vehicles or as command/telemetry transceivers.

Many of the radiolocation stations are capable of operating in all of the sub-bands (5.6–5.925 GHz).

The weather radars are located in the continental U.S. and are used in the Weather Forecasting and Observing System. The weather radars have the capability of tuning from 5.45 to 5.65 GHz.

Army. The Army's principal use of this band is for radiolocation and radionavigation. The remaining assignments are used for experimental purposes. Some of these experimental assignments are used for missile system tests.

Most of the radiolocation land stations are located in Alabama, Arizona, California, New Mexico and Utah. The equipment is used for range safety and precision tracking in support of airborne testing, missile testing and tactical and/or training operations. It should be noted that as a result of operational constraints, the precision tracking radars and associated transponders must operate in the upper portions of the overall band.

The radiolocation mobile equipment is deployed in about six states. The equipments are transponders used during missile and airborne tests.

The radionavigation, surveillance and mobile stations employ airborne transponders for operation of a test range radionavigation system.

Commerce. Commerce uses the 5.6–5.65 GHz frequency sub-band for operation of weather radars (meteorological aids service) and for radiolocation purposes.

The weather radars are located throughout the U.S. and are capable of operating in the sub-band 5.6–5.65 GHz. Currently, there are 71 assignments for Commerce weather radars. These assignments include the future equipments as well as the present. The equipment growth can be approximated by assuming a linear growth of 20% per year between 1975 through 1980. Therefore, the estimate of the number of radars operating by the beginning of 1977 is 28 stations. The radars, the WSR–74C, are used by the National Weather Service as part of the Weather Station Radar network. The overall investment cost by Commerce for this Network is in excess of 24 million dollars.

The three radiolocation stations are located in Colorado and Florida and are used to track weather balloons and obtain convection current information.

Energy Research and Development Administration (ERDA). ERDA uses this band for the radiolocation service. There is one radiolocation land station located in Nevada. This station is a portable tracking radar that is capable of operating between 5.4 to 5.9 GHz. ERDA also uses radiolocation mobile stations which are deployed in California, Hawaii, Johnston Islands, Nevada, New Mexico and Virginia. These stations are air-deployed transceivers that operate in the two sub-bands between 5.625–5.825 GHz.

Interior. Interior has three assignments in the sub-band 5.6–5.65 GHz. Two of the assignments are radiolocation land stations used to gather weather information. One of these stations is portable that may be used anywhere in the U.S., and the second is located in California. The third assignment is a weather radar used for storm detection in Alaska.

Navy. The Navy's principal use of this band is for radiolocation purposes with approximately 30% of the assignments used as weather radars or as experimental stations.

The majority of the radiolocation assignments are radiolocation land stations. These stations are located in California, Florida, Hawaii, Louisiana, Maryland, New Jersey, North Carolina, Pennsylvania, South Carolina, Texas, Virginia, Washington, Puerto Rico and Johnston Islands. Certain radiolocation assignments are used as radiolocation mobile stations. A limited number of assignments are "U.S. and Possessions" assignments with large numbers fields. These assignments represent the shipboard tunable radars operating in this band.

NASA. NASA uses this band for radiolocation land stations, radiolocation mobile stations, and experimental stations.

The radiolocation land stations are located in California, Nevada and Virginia and are probably used for instrumentation and test purposes.

The radiolocation mobile stations are airborne transponders located in Virginia.

Presently, NASA is studying the feasibility of using the 2.45 and 5.8 GHz band (see proposed international footnote 357A) for wireless transmission of power (WTP). The WTP system is in the conceptual stage. Presently, the 2.45 GHz ISM allocation is receiving the most consideration; however, footnote 357A would also provide for operation at 5.8 GHz.

Section 6.—EMC Considerations

6.1 *Introduction.* This section considers the EMC of non-Government proposed fixed and fixed satellite services and Government existing and proposed services operating in the bands 3.3–3.7 GHz, 4.4–4.9 GHz and 5.625–5.925 GHz. The non-Government and military have performed previous work in this area; however, there are many potential interactions not addressed in these analyses.

The non-Government Fixed Satellite Advisory Committee has investigated the following interactions.

(a) Shipboard radars and fixed satellite in the bands 3.4–3.7 GHz.

(b) Troposcatter system and fixed satellite in the band 4.4–4.9 GHz.

(c) Radiolocation and fixed satellite.

Additional non-Government analysis of radiolocation was sharing with the fixed satellite service in the 3.4–3.7 GHz bands was submitted to a GWARC Ad Hoc committee in January 1977 (GRC 798–III). It is assumed that GRC–798–III supersedes all applicable analysis previously made by the Fixed Satellite Advisory Committee.

The Navy is also investigating the compatability between the proposed fixed satellite and fixed services and Navy radars operating in the bands 3.3–3.7 GHz and 5.625–5.925 GHz. The Navy study is a Phase I (preliminary) study currently in the review stage. Based upon the initial results of the Phase I report, sharing between the fixed satellite and fixed services and the radiolocation service may not be possible without restrictions. Phase II (more detailed) sharing analyses efforts have been initiated by the Navy.

Previous studies by the non-Government and the Navy have been used wherever possible. In the cases where previous analysis information was not available, preliminary additional Federal Government sharing analyses were made. These cases and the associated frequency bands are:

(a) 3.3–3.7 GHz:

1. Aeronautical radionavigation (ASR's) and fixed satellite.

2. Airborne radars and fixed satellite.

3. Airborne radars and fixed.

(b) 4.4–4.9 GHz.

1. Mobile stations that are air deployed, and fixed satellite.

2. Radio astronomy and fixed satellite.

(c) 5.625–5.925 GHz:

1. Weather radars and fixed satellite.

2. Wireless transmission of power and fixed satellite.

Although the additional Government analyses are preliminary and are not all inclusive, these analyses provide insight that can be used for preliminary evaluation of the compatibility of various services. Due to the development activity in the frequency bands being considered, further analysis; particularly of military equipments may be appropriate.

6.2 *Analysis Parameters.* All of the analysis discussed within this report are based upon achievement of a specific interference to noise power ratio criteria.

Generally, the non-Government analyses relied upon existing CCIR reports to evaluate the compatibility between services. Normally, an overall interference probability criteria of 0.01 percent was used. Coordination distances between ground based systems were based upon C.C.I.R. report 382.2. This report has previously been used to establish coordination area requirements between earth stations and terrestrial radiocommunications services. In addition to determination of coordination distance by use of great circle propagation mechanisms, a rain scatter propagation model is also used. Based upon report 382–2, the propagation model requiring the greatest coordination distance is the mode to be taken into account.

The Phase I Navy and additional Government analyses are based upon a median (50%) probability criteria. The Federal Government analyses may be divided into two categories:

(a) Determination of a coordination distance between ground and/or air deployed systems.

(b) Whether or not a given INR criteria is exceeded for cases involving satellite interactions.

The coordination distance developed by the Federal Government analyses where based upon an automated smooth earth propagation model. This model provides the long-term median value of propagation loss and includes the combined effects of diffraction and troposcatter. This model does not determine the coordination distance associated with rain scatter or other low probability phenomenon, which may exceed the distanuce calculated by the smooth earth model.

Development of Coordination Distances. The median value of propagation loss was calculated in accordance with the following equation:

$$L=P_T+G_T+G_R-KTB-INR+DC-BW \quad (6.1)$$

where

P_T=peak output power in dBw.

G_T=Transmitter antenna gain in the direction of the receiver in dBi.

G_R=receiver antenna gain in the direction of the transmitter in dBi.

KTB=receiver noise level, Boltzmann's constant (K) times effective system noise temperature (T) times receiver bandwidth, BW_R in dBw.

INR=interference to noise power ratio, dB.

DC=duty cycle of interference emission in dB.

BW=ratio of the receiver 3-dB filter bandwidth BW_R and the 3-dB emission bandwidth BW_T of the interferer in dB.

$$BW=10 \log \frac{BW_T}{BW_R},\ BW_T>BW_R$$

$$BW=0,\ BW_T \leq BW_R$$

The coordination distance was then established by use of the smooth earth propagation model.

Satellite Interactions. The satellite is stationary, thus interactions between the satellite and other services are evaluated by:

$$\text{KNR}=\text{I}-\text{KTB} \quad (6.6)$$

Where

INR and KTB are as previously defined. I is the interference receive power in a reference bandwidth, dBw

A test of equality can then be made to determine if the INR ratio exceeds the criteria.

Equipment Characteristics. The equipment characteristics used for the additional Federal Government analyses are given in table 6.1. The characteristics of the Government equipments (item No. 1 through 4) were obtained from C–E or assignment record information. The characteristics of the wireless transmisisons of power (WTP) system (item No. 5) was provided via telecom. with NASA representatives. The fixed microwave equipment (Farinon SS4000W) characteristics were provided by a brochure. The earth station characteristics were obtained by using measured characteristics of an INTELSAT ground station. The satellite receive characteristics were extracted from the HS333 Canadian domestic satellite characteristics.

The INR criteria used in this report were obtained by using the values assumed in the non-Government analyses, Navy analysis and other previous Government analysis. The INR values used were:

(a) 0 dB for all radars.

(b) −10 dB [3] for fixed and fixed satellite services.

(c) −5 dB for mobile (air deployed) services.

[3] For the cases where pulsed systems are the interferer, an average interference power criteria was used. The criteria will not be valid for some conditions involving high data rate digital reception.

TABLE 6.1

Equipment Characteristics

ITEM	NOMENCLATURE	TRANSMIT POWER, dBw	PRF, PPS	PULSE WIDTH, μsec	3 dB EMISSION BANDWIDTH, MHz	ANTENNA MB	ANTENNA SL	RCVR NOISE FIGURE, dB OR (TEMPERATURE), °K	3 dB IF BANDWIDTH, MHz	AVERAGE ANTENNA HEIGHT ASSUMED, FT
1	ASR[1]	50	1000	0.6	1.8	32	10[2]	5 dB	2.3	50
2	Airborne Rdr	33	3000	0.25	4.0	3	0	27 dB	5.0	30,000
3	Airborne System-Classified	20	NA	NA	5.0	3	0	30 dB	6.5	60,000
4	WSR-74C	54	266	3	0.5	40	NOT REQ.	NOT REQ.	NOT REQ.	50
5	NTF-NASA PROPOSED SYSTEM	100	NA	NA	UNKNOWN BASICALLY CW	67	NOTE 3	NOT REQ.	NOT REQ.	SYNCHRONOUS ORBIT
6	FARINON MICROWAVE (SS 4000)	7	NA	NA	20.0	38	-10	9 dB	20.0	250
7	SATELLITE EARTH STATION	NOT REQ.	NA	NA	NOT REQ.	59	NOTE 4	(80 °K)	1 to 36 ASSUMED	50
8	SATELLITE	NOTE 5	NA	NA	NOTE 5	18	0	8 dB	1 to 36 ASSUMED	SYNCHRONOUS ORBIT

NOTES: 1. These characteristics were extrapolated from ASR 9 and existing FAA data.

2. The ASR antenna pattern will be a modified $\csc^2$ pattern. Gain of 32 dBi @ 5° and 10 dB at 0° and 30° elevation was assumed.

3. An extremely large array is used in this system. Gain of 10 dBi was assumed for 10 degrees off-axis and -10 dBi for 90 degrees off-axis.

4. Off-axis gain levels were calculated by using CCIR Report 391-2.

5. Power flux density limits were used for the calculation.

Satellite Parameters. The Radio Regulations specifies the maximum allowable power flux density (PFD) at the earth's surface produced by the fixed-satellite downlink. In the bands between 3.4–7.75 GHz, RR470NM Spa 2 states: "The power flux density at the Earth's surface produced by emissions from a space station or reflected from a passive satellite for all conditions and for all methods of modulation shall not exceed the following values:"

$152+\frac{\delta-5}{2}$ dBW/m² in any 4 kHz band for angles of arrival δ (in degrees) between 5 and 25 degrees above the horizontal plane;

142 dBW/m² in any 4 kHz band for angles of arrival between 25 and 90 degrees above the horizontal plane.

These limits relate to the power flux density which would be obtained under assumed free-space propagation conditions.

Satellite system design is governed by an overall performance criteria, i.e. achievement of a particular signal-to-noise ratio for the entire link. In some cases, like FM TV video transmissions where energy dispersal waveforms are employed, the limits given in RR470NM might be experienced. It is realized that the maximum *PFD* limit may be reduced by more than 20 dB for some links; however, the maximum level has been used for the initial OT analysis.

The conversion from *PFD* to interference power in a receive bandwidth may be expressed in logmetric form as:

$$I=PFD(\delta)+G_R+10\log\left(\frac{\lambda 2}{4\pi}\right)+10\log\left(\frac{BW_R}{4\text{ kHz}}\right) \quad (6.3)$$

where

I=maximum power in BW_R, dBW.
G_R=receive antenna gain, dBi.
λ=wavelength, meters.

6.3 *EMC Analysis of the 3.3–3.7 GHz Bands.* The results of previous sharing studies considering the EMC between radiolocation and the fixed satellite and fixed services are discussed in this section. These results are followed by additional Federal Government analyses of the following interactions:

(a) Aeronautical radionavigation (ASR's) and fixed satellite,

(b) Airborne Radars and fixed satellite stations,

(c) Airborne Radars and fixed stations (Farinon SS4000W).

EMC of Radiolocation and Fixed Satellite. The initial analysis made by the Fixed Satellite Advisory Committee concluded that sharing between the radiolocation and fixed satellite services is possible if the satellite PFD is limited to −122 dBw/m² in 2.5 MHz.

On January 28, 1977, a new document, GRC–798–III, addressing this subject was introduced to members of the Ad Hoc committee. The conclusions of this analysis were:

a. "The earth station coordination aspects do not appear to involve greater difficulties than that associated with the fixed service."

b. "It would appear that the present PFD limit would be tolerable in that actual interference cases would involve a maximum penalty of 1% on the radar coverage capability."

A brief discussion of these general conclusions is required in order to fully understand the impact of these statements.

The coordination distance required between radiolocation stations and satellite earth stations are approximately 100 miles for normal propagation modes. However, consideration of rain scatter coordination distance extends this required separation to about 280 miles.

Limitation of the coverage area by 1 percent would have little impact upon radars used for training. However, if radars are used for air defense purposes, the restriction of 1 percent would weaken the overall function of these systems. An alternative discussed in GRC 798–III would be to restrict the maximum PRD limit to a level of −165 to 173 dBW/m²/4KHz which would result in an overall INR of 0 dB.

EMC of Radiolocation (Shipboard Radars and Fixed). The proposed fixed stations would be used to provide line-of-sight communications for common carrier users (inferred by 3rd NOI). Currently, the fixed service is proposed on a secondary basis in the sub-band 3.3–3.4 GHz. Under a secondary allocation, the fixed service must accept interference from the radiolocation service. Normally, common carrier users desire highly reliable links. Achievement of this goal may require that the proposed fixed service be allocated on a primary basis. Consequently, sharing between radiolocation and the fixed services was addressed within this report.

The calculations provided by the Phase I

Navy study generally indicates that distance separation between the radiolocation (shipboard radars) and fixed stations of less than 210 miles will preclude interference in the 3.3–3.4 GHz sub-band. This assumes worst case mainbeam-to-mainbeam coupling. Under less extreme conditions, mainbeam-to-sidelobe, a distance separation of less than 85 miles is required.

EMC of Aeronautical Radionavigation and Fixed Satellite. The FAA ASR is planned to be used by aeronautical radionavigation service, i.e., is considered as a safety-of-life service.

Satellite Interference into ASR. The interference-to-noise power ratio may be calculated by using equation 6.2 and 6.3 in conjunction with the ASR characteristics given in table 6.2. The INR in 2.3 MHz for the mainbeam coupling case is about 12 dB. The elevation angle within CONUS for mainbeam coupling to the satellite will vary as a function of ground station locations and satellite orbital position. The minimum angle is about 5 degrees and the maximum angle is about 55 degrees. Assuming that the existing ASR–8 antenna characteristics will be similar to the proposed ASR, the approximate antenna characteristics are:

3 dB azimuth beamwidth of 1.35 degrees
one antenna rotation in 4.8 seconds.

As the ASR sweeps in azimuth, the receiver may see as many as 35 interfering stationary sources (assuming orbital spacing of 3°) with various levels of interference. Conceivably, all of the interference levels could be above the noise if maximum PFD limits are used. The 3 dB beamwidth dwell time is $\frac{(1.35)}{360}$ 4.8 seconds or about 18 milliseconds.

Thus, interference may be experienced for about 630 pulses/scan.

The only acceptable alternative to the FAA would be to lower the PFD limit for this band. Generally, a reduction of 15 dB would probably be ample. However, establishment of an INR specification level requires further analysis and coordination with the FAA.

ASR Interference into Satellite Earth Station. The loss required to preclude interference between the earth station and ASR (eq. 6.1) by using the parameters provided in table 6.1 are:

$$L=(174.7+G_R+G_T)\ dB$$

assuming an ASR tilt angle of 4° and an earth station elevation angle of 5°, the required loss is

$$L_{\simeq}(174.7+10+14.5)\ dB=199.2\ dB$$

Based upon a smooth earth propagation prediction model, the required distance separation is 60 miles.

EMC of Airborne Radar and Fixed Satellite. The airborne radars are used for navigation station keeping on cargo-type aircraft. Due to the large number of these equipments, it is assumed that the airborne radars may be used in the U.S. during flight between bases. Also, there are new airborne radars being developed for use in portions of the band.

Satellite Interference into the Airborne Radar. The airborne radars have a very high noise figure (over 20 dB above the ASR) and a low antenna gain; therefore, it is evident that the satellite will not interfere with this system.

The Airborne Radar Interference into Satellite Earth Stations. The loss required to preclude interference, as calculated by equation 6.1, and using the equipment parameters defined in table 6–1 is:

$$L=155.4+G_R+G_T$$

Assuming 5 degrees off axis for the earth station and mainbeam coupling from the airborne radar (3 dBi gain)

$$L_{\simeq}173\ dbB$$

The aircraft may fly at an altitude of 30,000 feet. Consequently, the required slant range is 250 miles. This distance is in the diffraction region; thus, small increases in loss will have negligible effects upon the distance.

EMC of Airborne Radars and Fixed. Airborne radars may fly at an altitude of 30,000 feet or greater. Effectively, this will increase the line-of-sight distance to about 250 miles. Consequently, the additional loss advantage of diffraction, as experienced by ground based equipments, is not realized.

Airborne Radar Interference into Fixed Stations. The Farinon SS4000W microwave equipment is a 600 channel system and has been assumed to be typical of fixed service equipment proposed for operation in the 3.3–3.4 GHz sub-band. The medium propagation loss as calculated by parameters given in table 6.1 and equation 6.1 is:

$$L=134.4+G_R+G_T\ in\ dB$$

The loss is 175.4 dB for mainbeam to mainbeam couping (low probability of occurrence), and the corresponding slant range is about 250 miles.

The loss is 127 dB for airborne mainbeam and fixed station sidelobe antenna coupling. The corresponding slant range is 10 miles.

Fixed Service (SS400W) Interference into the Airborne Radar. This calculation is not required since the constraining system is the fixed station. This is evident by the high noise figure given in table 6.1.

6.4 *EMC Analysis of the 4.4–4.9 GHz Band.* The results of the Fixed Satellite Advisory Committee have been summarized to portray the EMC between high powered fixed stations (troposcatter) and the proposed fixed satellite service. This summary is followed by a preliminary Federal Government analysis of airborne mobile stations, and the fixed satellite service. Also, the impact of satellite emission upon the radio astronomy is discussed.

EMC of Troposcatter Systems and Fixed Satellite. The Fixed Satellite Advisory Committee sharing analysis concluded that sharing between troposcatter systems and earth stations require large coordination distances (308 miles). This analysis concludes that sharing of fixed satellite and troposcatter systems should be able to be accommodated.

Troposcatter Interference into Earth Stations. The coordination distances developed by the advisory committee, assuming 10° horizontal angle, are:

(a) About 154 miles (250 Km) separation between the troposcatter system and earth station is required, based upon great circle propagation mechanisms for 0.01% of the time.

(b) About 308 miles, worst case, based upon rain scatter.

Satellite Interference into Troposcatter. The Fixed Satellite Committee calculations showed that the troposcatter antenna could not point closer than ±4 degrees of the satellite geostationary orbit without exceeding an INR criteria of −10 dB. This calculation assumes maximum PFD of −152 dBw/m²/4 Kz. If the PFD was reduced to −160 dBw/m², the troposcatter antenna may look up to ±2 degrees of the geostationary orbit and receive adequate protection. A PFD of −173 dBw/m²/4 KHz is required to achieve an INR of −10 dB.

EMC of Mobile (Airborne) System and Fixed Satellite. As of this date, interactions between airborne mobile systems and the proposed fixed satellite service in the 4.4–4.9 GHz band have not been investigated. As indicated in Section 4, there are several airborne systems capable of operating in the 4.4–4.9 GHz band.

Satellite Interference into Mobile Stations. The calculated value of the interference-to-noise ratio (eq. 6.2 and 6.3) shows the interference is 39 dB below the noise in a 6.5 MHz bandwidth. Therefore, it appears that this link is compatible.

Mobile Station Interference into Earth Stations. Some of the airborne systems are designed to fly at low altitudes: others at high altitudes. One of the high altitude systems was chosen for this analysis, thus, an altitude of 60,000 feet was used.

The loss, L, is:

$$L=172.6+G_R+G_T$$

if $G_R=3$ dB
$G_T=17$ dB (4 degrees off-axis)
$L=192.6$ dB

Based upon smooth earth prediction models, the slant range is 360 miles.

The required loss is about 163 dB for $G_T=0$ and $G_R=-10$. The corresponding distance for this condition is about 340 miles.

EMC of Radio Astronomy and Fixed Satellite. CCIR report 224.3 contains the power flux density for typical line measurements. The level of signal causing harmful interference is a PFD of −196 dBw/m²/4 KHz (isotropic antenna). Due to the sensitivity of these systems, it is apparent that the two services are not compatible. A portion of the satellite downlink spectrum could be "notched out" by employing multi-section filters. This approach would decrease the performance and increase the cost of satellite systems.

6.5 *EMC Analysis of the 5.625–5.925 GHz bands.* Previous EMC analyses between the radiolocation and proposed fixed satellite service have been made by the Fixed Satellite Advisory Committee and by the Navy. Summaries of these analyses are provided in this section. Also, sharing between the following services have also considered:

a. Weather radars and fixed satellite.
b. WTP and fixed satellite.

EMC of Radiolocation and Fixed Satellite. The Fixed Satellite Advisory Committee concluded that sharing between the radiolocation and fixed satellite (uplink) services is not feasible. This analysis found that the interference from a radiolocation device into the satellite is over 30 dB greater than the maximum permissible interference into the satellite.

The Phase I Navy study has also concluded that Navy radiolocation and the proposed fixed satellite service may be incompatible for operation in this band.

EMC of Weather Radars and Fixed Satellite. U.S. Department of Commerce/National Weather Service uses the 5.6–5.65 GMz band for operation of weather radars. Weather (WXD) radars are used to detect, locate, track and measure meteorological phenomena. In order to perform these functions, the coverage volume of Weather radars cannot be restricted. The INR (Eq 6.2) during periods of mainbeam coupling (assuming global coverage of satellite antenna) is about 20 dB. This exceeds the acceptable criteria of −10 dB by 30 dB; consequently, in-band sharing between these services is not feasible. The present allocation provides for 50 MHz of spectrum for operation of this service. If the WXD radar spectrum was reduced to 25 MHz (5.6–5.625 GHz) intra-system interference is anticipated.

WTP Interference to Satellite. The Proposed WTP system will require an extremely narrow beam width antenna (0.008 degrees)

in order to provide efficient transfer of energy. The conceptual system characteristics have been estimated as:

Transmit power—10 Giga Watts.
Type antenna—Phase Array.
Antenna Gain—87 dBi (approximate).
Modulation—non essentially CW.

The proposed system will be located on a geostationary satellite platform. Assuming a maximum transmit and receive total gain coupling (G_T+G_R) of −10 dBi, the amount of CW power at a satellite receiver spaced 10 degrees away is approximately −94 dBw.

The other extreme is a satellite spaced approximately 160 degrees away in synchronous orbit. Under these conditions, the total coupling gain will be higher or approximately 20 dBi (10 dBi+10 dBi) and the amount of CE power at the satellite is approximately −84 dBw.

For a 36 MHz channel, the satellite noise power is −121 dBw. Clearly, the WTP CW signal will cause interference to the fixed satellite.

JOINT STATEMENT OF CHAIRMAN RICHARD E. WILEY AND COMMISSIONER MARGITA E. WHITE

In Re: Fifth Notice of Inquiry in Docket 20271, Preparation for the 1979 World Administrative Radio Conference (WARC).

Dissenting only with respect to the majority's decision to limit future flexibility in the international arena in the 512–608 MHz and the 614–806 MHz portion of the spectrum.

We wholeheartedly agree with a great portion of the Commission's decision that provides for a flexible approach in establishing our recommendations for the 1979 WARC. However, the majority has not seen fit to extend flexibility to the 512–608 MHz and 614–806 MHz portions of the spectrum.

It must be empahsized that this proceeding is another step in the development of the U.S. position for the upcoming 1979 WARC and should reflect this country's best interests in international radio rules and regulations over the next twenty year time period. As a result of the inherent difficulties in accurately forecasting long-term future service by service spectrum demands, the theme of the preparatory effort to date in all areas, including allocation proposals, has been flexibility—flexibility to account for unpredictable changes in technology, economics, or national interest. We disagree that the information developed in the record at this stage of the proceeding is sufficient to warrant decisive and inflexible long-term allocation proposals in these bands. If the majority's decision today becomes the final U.S. position, it may make it impossible for a later Commission—faced with concrete facts and possible new technologies—to meet its responsibility under the Communications Act to "encourage the larger and more effective use of radio in the public interest."

It would seem that the Commission is making a decision that it need not make in 1977. This is an international proceeding, not a domestic rule making. Establishing the entire band as broadcasting and mobile internationally would not dictate or even suggest a change in our domestic allocations. (Indeed, the international VHF band is allocated to fixed, mobile and broadcasting services while our national allocations permits only television broadcasting in this band.)

Our dissent on this matter should not be construed in any way as a deviation from our joint commitment to fostering the fullest practical development of UHF television. We fully understand that the future course of UHF depends very fundamentally on the continued availability of ample spectrum space. It was for this reason that we supported initiation of the UHF Task Force to carefully study the future needs of UHF broadcasting and to develop a plan to preserve the spectrum required to meet those needs. This task is a complex one, and even preliminary results cannot be expected until the advanced stages of the proceeding. Without attempting to prejudge future domestic findings, the uncertainty at this point suggests that the best direction to follow internationally should be to preserve our fullest degree of flexibility.

We are encouraged by the fact that this is not the Commission's final recommendation but rather the Fifth Notice of Inquiry. Fortunately, the Commission will have additional opportunities to reconsider this point as the formal proceeding advances. We trust that the majority will approach future decisions on flexibility with an open mind. Those who feel that the majority decision today is incorrect are invited to provide the most accurate and comprehensive information possible in response to this Inquiry. They may have lost this battle, but perhaps not the WARC.

STATEMENT OF COMMISSIONER JOSEPH R. FOGARTY

In Re: Fifth Notice of Inquiry in Docket 20271, Preparation for the 1979 World Administrative Radio Conference (WARC).

CONCURRING IN PART; DISSENTING IN PART

While I concour in the bulk of the proposals adopted in this Fifth Notice of Inquiry, I dissent from the proposal of the Commission majority that the international allocation for the 470–890 MHz (UHF) band be made to conform with our existing domestic allocation, except for the 806–890 MHz band where Mobile Services are proposed to be primary and broadcasting services secondary. In my judgment, this proposal fails to recognize the imperative need for flexibility in meeting future domestic spectrum requirements. I think that this Notice should have set forth the following proposal for the 470–890 MHz band:

470–608 MHz Broadcasting/Mobile; 608–614 MHz Broadcasting/Mobile/Radio Astronomy; and 614–890 MHz Broadcasting/Mobile.

These are my reasons in support of both the dissent and the substitute proposal:

At the outset, it should be emphasized that the WARC meets to determine international allocation of the spectrum approximately once every 20 years. Thus, if sufficient flexibility is not incorporated into the international regulations prescribed by the 1979 WARC, U.S. telecommunications requirements may be restricted severely through the year 2000. On the other hand, adoption of principles favoring maximum flexibility at the 1979 WARC would permit and facilitate changes in the U.S. domestic allocation table which may be required to meet future spectrum needs for the expansion of existing services and the development of new communications systems.

A brief summary of the various radio service working group projections of future UHF spectrum requirements serves to illustrate the need for a U.S. position of maiximum flexibility at the 1979 WARC. Broadcast interests have predicted that by the year 2000 a full complement of frequencies between 470 and 806 MHz will be required for commercial and noncommercial UHF television. The industry foresees public television station growth from the present 160 to more than 420 stations by the year 2000 and expects similar growth and spectrum saturation for commercial UHF-TV.

Beyond Commission decisions taken in Dockets 18261 and 18262, non-government non-television interests have predicted requirements, particularly for short range mobile communications, which, by the year 2000, could amount to approximately 268 MHz of the 470–806 MHz band. Based on projections from dramatic recent growth, particularly in the nation's major urbanized areas, and Commission licensing records, land mobile interests predict that by the end of this century there will be 2.1 million base station transmitters or 5.5 times the number existing in 1975. From these predictions, it is argued that in addition to the recent allocations in Dockets 18261 and 18262, between 102 and 174 MHz will be needed from the remaining UHF bands between 512 and 806 MHz.

International mobile service interests have also asserted the need for additional UHF spectrum to meet projected service requirements to the year 2000. The maritime community submits that by the end of the century an increased allocation of 15 to 18 MHz will be required if current traffic and demand trends continue. The aeronautical service has likewise advanced a projected need for 30 MHz of the UHF spectrum to allow for the development of new communications systems to keep pace with the introduction of more high capacity, high performance aircraft and related service requirements.

Government agencies, in addition, have expressed the need for access to 100 MHz in the 470–806 MHz band.

The only certain conclusion to be drawn from these industry working group projections is that there are significantly more demands for UHF spectrum than there is spectrum to allocate. Of course, each working group prediction tends to "maximize" its vision of future spectrum need to the virtual exclusion of competing service requirement projections. Due to the lack of sufficient information to confirm or modify these competing projections of spectrum need, it must be conceded that we are now in no position to formulate a rational plan for future UHF allocations which will enjoy any certainty of being in the overall national interest.

This conclusion is compelled not only by the paucity of reliable information as to future needs, but also by the rapidly changing nature of communications technologies applicable to the use of UHF frequencies. The Commission is currently engaged in an investigation of the future needs of television in the UHF band. Preliminary study suggests a great likelihood that technology improvements in TV receiver design will permit substantial reduction of the UHF-TV "taboos" thereby allowing many more TV stations to operate in the available spectrum than are currently permitted. With respect to the future needs of the land mobile community, there are complex, unresolved questions as to the actual load and usage of the spectrum currently allocated and whether advanced cellular and other technology may result in optimal utilization and conservation of spectrum. The several service working groups have not included in their reports any assessment of the impact of new technology on their projected spectrum needs. This deficiency further underscores the likelihood of miscalculation inherent in any attempt to establish future UHF spectrum retrum requirements now for the period contemplated by the 1979 WARC regulations.

Given this certainty of future uncertainty, reason and common sense clearly dictate that a proposal of maximum flexibility in UHF allocations would best serve this nation's overall telecommunications interests at the 1979 WARC. A majority of the Commission, however, takes a contrary position that it is imperative to freeze the existing domestic allocation internationally. I am frankly at a loss to understand why.

The majority's proposal is premised ostensibly on an overwhelming solicitude for the

future welfare of television in the UHF band. Indeed, one might reasonably infer that the majority has already weighed the complex and problematical projections of competing spectrum need for the remainder of this century and found all but those of UHF television lacking in credibility and consequence. The record of UHF television development to date, however, instills little confidence in the majority's clairvoyance. At present, there are 371 comercial and noncommercial UHF–TV stations on the air, less than one-third (30 percent) of the total 1269 current allocations. Although UHF–TV growth increased 300 percent between 1960 and 1975, UHF–TV total allocation usage has remained constant for the last five years. Whether this indicates a "plateau" of UHF–TV growth or merely a temporary lag is unclear at this point. While we all have high hopes for UHF television development in both the commercial and noncommercial sectors, a more convincing demonstration of actual future need is required, I think, before we reserve the lion's share of the 470–890 MHz band exclusively for UHF broadcasting.

Even if the majority's crystal ball assessment of UHF television needs to the end of the century were supported by reasonable arguments, the wisdom of the Commission's proposed WARC position would still be less than self-evident. If the only choice were between exclusive UHF allocations for television or non-television services, I could understand a Commission decision opting for TV broadcasting. The majority's decision, however, appears to assume a need for such exclusivity which I do not believe exists. Were the United States to adopt and gain international acceptance of a position calling for shared access to the 470–890 MHz band, such action would not reallocate a single frequency currently designated by the existing domestic table. Implementation by the United States of an international reallocation of UHF spectrum would be subject to a separate rule making in which all interested parties would have the opportunity to comment and the Commission would have the opportunity, also, to weigh competing spectrum needs In advancing a WARC proposal which would freeze the current UHF domestic allocation, the Commission unnecessarily prejudges competing future needs and forecloses the opportunity to meet our mandate of promoting the larger and more effective use of radio in the public interest.

I want to answer one final argument which has been raised in support of the position of inflexibility taken by the majority. It has been argued that if a proposal calling for shared access throughout the 470–890 MHz band were adopted, it would have a "devastating psychological impact" upon the broadcast industry. This would occur, so the prophets contend, because any such allocation proposal would be seen by the industry as an "abandonment" of UHF–TV and by the other radio service industries as an "open invitation to raid" the UHF spectrum heretofore reserved exclusively for broadcasting.

As I have emphasized already, adoption of a flexibility approach and principle at the 1979 WARC would not reallocate any domestic UHF frequency away from television to non-television use. It would preordain neither an "abandonment" of UHF television nor an apocalyptic "raid" on UHF spectrum by the non-television services. Such an approach, however, would allow this Commission to ascertain and meet future spectrum needs as they become more clearly evident and put the interested industries to the proof in the implementing rulemakings for allocating a scarce spectrum resource. The paramount public interest in a rational, farsighted allocations policy demands no less, and competing industry interests are entitled to no more.

If this statement of purpose will not allay the "psychological" concerns of the broadcast industry, then I would seriously question the rationality of those concerns and not the wisdom of a policy favoring flexibility in future allocations. In this regard, while I recognize and remain committed to the Commission's policies for fostering the continued development of UHF television, I doubt that our mandate in this area includes assuming the role of psychiatrist for that industry. If, however, our mandate does require us to play that role, I think that the patient's mental health—and economic and technological well-being as well—would be better served by a confrontation with reality, rather than by reinforcing any delusions of grandeur or paranoia.

I hope that the majority's decision on this matter is not irreversible, and that a more objective analysis of the comments to be received in response to this Fifth Notice of Inquiry will lead to a modification of the Commission's proposal. To the extent that this initial proposal would limit use of the UHF band to the detriment of this Commission's ability to meet future U.S. telecommunications requirements, I dissent.

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